AIR CONDITIONING HEATING AND VENTILATING

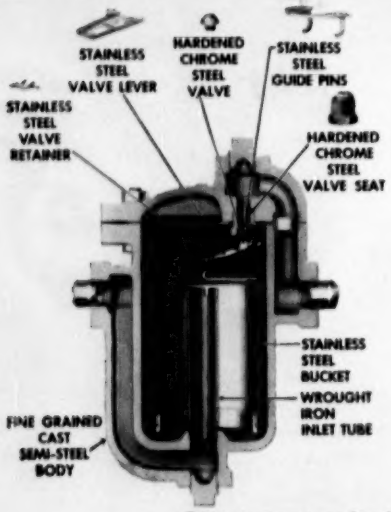
FEBRUARY, 1955—52nd YEAR

Water Supply for Tall Buildings
Page 99

Contents Page 3

Companions for 11 years at 5 psig, 7" Hg. . . .

Armstrong Trap Maintenance: 2¼¢ per year


STAINLESS STEEL VALVE LEVER
HARDENED CHROME STEEL VALVE
STAINLESS STEEL GUIDE PINS
STAINLESS STEEL VALVE RETAINER
HARDENED CHROME STEEL VALVE SEAT
STAINLESS STEEL BUCKET
WROUGHT IRON INLET TUBE
FINE GRAINED CAST SEMI-STEEL BODY

● This low pressure heating system trap has same design, materials and workmanship as traps for 900 lb. pressure, 900° F. jobs.

No wonder it lasts so long!

If you are responsible for a low pressure, vacuum return heating system, installation or operation, new or old, can you confidently expect steam trap repair parts costs anywhere near as low as 2¼¢ per trap per year over an 11 year period? That's the service record of over 100 Armstrong inverted bucket steam traps on a 5 lb. steam pressure, 7" vacuum return heating system at Globe Steel Tubes Company, Milwaukee, Wisconsin. It is not an unusual record for Armstrong traps, either. But, repair parts are the small item.

It pays to take a good, long look at steam trapping from three points of view:

1. Trap Maintenance—how much time and nuisance and cost is, or will be, involved in keeping traps operating properly, especially after they are a few years old. Time and again maintenance of Armstrongs has proved to be a fraction of that of the traps they replaced.

2. Holding Vacuum—biggest source of trouble is leaky steam traps! Have you read the article "Flash at Traps" by T. M. Reynolds. If not send for a free copy. It proves that leaks, not flash, are the problem.

3. Heat—how fast can you heat up a cold system and how much heat can you get out of it? Armstrongs discharge condensate at steam temperature as fast as it reaches the trap. And plenty of air handling capacity is built right into the trap. You get fast heat and maintain maximum temperatures all the time.

You have nothing to lose by talking it over with your local Armstrong Representative—remember he sells the traps that are *unconditionally guaranteed to satisfy the user* or the purchase price is refunded. Call him today or write Armstrong Machine Works, 846 Maple St., Three Rivers, Michigan.

Application Engineered

ARMSTRONG STEAM TRAPS

Free "Steam Trap Book"

44 pages of trap data, prices, selection, installation and maintenance information on trapping low, medium and high pressure lines and equipment. Send for it today—no obligation.

Don't forget to ask for the article "Flash at Traps"

How to exhaust fumes from boiling brass . . . without hoods

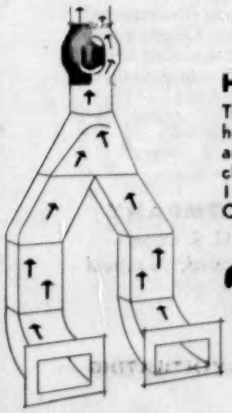
In brass melting furnaces, normal temperatures run from 1850° to 2350° F. Terrific heat and irritating fumes are given off by these open furnaces.

To improve working conditions around their furnaces, Standard Brass Manufacturing Company of Kansas City, Missouri tried several fan and hood systems without success. Then they installed five DeBothezat Bifurcator Fans, one for each two furnaces. Bifurcators with 27" diameter fan-wheels and 2 HP motors, operating at 1140 RPM, were selected. The high velocity of these DeBothezat Bifurcator Fans made it possible to use open ducts behind the furnaces in place of hoods above them.

Now working conditions around the furnaces are satisfactory. And furnace charging and unloading is safer, easier and faster *without hoods.*

DeBothezat Bifurcator Fans are ideal for installation where space is limited, because they are compact, and install right in the duct work. Bifurcator Fans can be made of carbon steel, stainless steel, rubber coated steel, monel metal and many other corrosion or heat-resistant materials.

If you have a fume removal problem, DeBothezat Bifurcator Fans may be the answer. Write our factory for illustrated catalog DB-4-53.



HOW BIFURCATOR WORKS

The Bifurcator is a motor driven axial-flow fan in a patented, divided housing. Motor is in an isolated chamber around which flue gases are by-passed (bifurcated) so that the motor always remains cool, clean and accessible. Bifurcators are available in many sizes from 1140 CFM (12" diameter fan with 1/20 HP motor) up to 45,000 CFM (48" diameter fan with 20 HP motor).

DeBothezat Fans

Division of American Machine and Metals, Inc.
EAST MOLINE, ILLINOIS

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DeBOTHEZAT FANS DIVISION
American Machine and Metals, Inc.
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Send me free Catalog DB-4-53 containing full data on Bifurcators.

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NAME AND TITLE

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"We have literally found a thousand and one uses for Webster Tru-Perimeter Heating — we have installed it in buildings of almost every type," says Edward R. Sabin, Jr., Philadelphia heating contractor.

By installing Webster Forced Hot Water Tru-Perimeter Heating instead of conventional steam heating, this heating contractor has provided savings of 15 to 20% for owners of large commercial and institutional buildings. And, when bidding on low or medium-priced operation houses with summer-winter hook-up, Sabin's price for Webster Forced Hot Water Tru-Perimeter Heating comes within $50 per house of the warm air bid. "And builders recognize the selling advantage of Webster Baseboard Heating," Sabin says.

Today, heating contractors are finding that many opportunities lie with Webster Tru-Perimeter Heating — in every type of building, from the small operation house to large institutions.

Talk to your Webster Representative.

TRU-PERIMETER HEATING IN OPERATION HOUSES

Webster Baseboard Heating is practical even in lowest-cost developments because it requires minimum of piping, auxiliaries and controls. The heating element combines heating unit and main, concealed behind unobtrusive baseboard.

Inconspicuous Webster Baseboard Heating in living room at Marple Gardens. Note wall-to-wall carpeting, floor length draperies, complete freedom in furniture decoration. Basic house sells for $13,490. Architect: Jesse L. Stetler. Builder: McGarry & Cella. Plumbing & Heating Contractor: Edward R. Sabin Co.

TRU-PERIMETER HEATING IN AIR-CONDITIONED BUILDINGS

Sabin sells "a comfort team" — your own choice of air-conditioning *plus* a Forced Hot Water Tru-Perimeter Heating System using Webster Walvector.

F. W. Woolworth Co. Store, Castor Ave., Philadelphia. First of two forced hot water heating installations using Webster Walvector in new Woolworth stores in Greater Philadelphia. Builder: Hyman Korman. Heating Contractor: Edward R. Sabin Co.

TRU-PERIMETER HEATING IN APARTMENTS, CHURCHES, OFFICE BUILDINGS

Typical Sabin-installed jobs include: Lankenau Professional Building, Philadelphia; St. Bernadette Catholic Church, Drexel Hill, Pa.; Pennsylvania Film Productions, Philadelphia; Baptist Church, Marcus Hook, Pa.; L. H. Parke Co., Philadelphia, and the Convent of the Good Shepherd, Philadelphia.

Nurses' residence in the 40-apartment Lankenau Professional Building at new Lankenau Hospital, Philadelphia. Clean, quiet, comfortable heating — with Webster Walvector warming every outside wall. Architect: Vincent Kling. Builder: Nason & Cullen. Heating Contractor: Edward R. Sabin Co.

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TRU-PERIMETER FORCED HOT WATER HEATING

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AIR CONDITIONING HEATING AND VENTILATING

FEBRUARY, 1955

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CONTENTS

VOL. 52 No. 2

FEATURE ARTICLES

Ceramic Coated Steel Resists Heat and Corrosion 85
Industrial Reodorants—B. K. Tremaine 83
How to Size and Install Gas Water Heaters Correctly—R. Murray 86
Design Corrections for Altitude—N. L. Vinson 91
High Capacity Boilers in Sweden—H. Lundbergh 97
Centrifugal Pump Couplings—I. J. Karassik, R. Carter 109
Effect of Soils on Asbestos-Cement Pipe 112
Residential Air Conditioning Discussed by ASRE 113
Engineers Turn Time Back to Aid Hospital 148

REFERENCE MATERIAL

Section—Water Supply for Tall Buildings—J. C. Church 99
Detail Sheet—Rear Hood for Tank or Table; Details of a Soldering Bench 107
Data Sheet—Tables for Determining Absolute Humidity ..... Opposite 170

DEPARTMENTS

Washington News—L. F. Overman 4
Briefly Stated 8
London Letter 115
News of Equipment and Materials 117
New Catalogs 141
Piping and Plumbing—L. Blendermann. 144
News of the Month 150
Ad-Digest 151
Degree-Days for December, 1954 158
Canadian Degree-Days for Nov. and Dec., 1954 167
Coming Events 167
Index to Advertisers 169

The Cover: Part of New York City's famous skyline. Tall buildings require water systems of special design. See page 99.

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Washington News

LORING F. OVERMAN

WITH the 84th Congress only weeks old, the legislative hoppers of both Houses are already overflowing with hundreds of proposals for new legislation dear to the heart of some Senator, Congressman, or constituent. Many of these proposals are of direct interest to those in the fields of air conditioning, heating and ventilating. Others affect the entire business community.

Gas Supply Regulation

Immediately upon completion of the reorganization of Congress to give the Democrats top spots all the way down the line, Washington began choosing up sides to settle the question of whether the Federal Power Commission has authority to control charges made for gas by independent producers and gatherers.

The outcome is expected to have an important bearing on amounts that can be charged for natural gas, on sums that can be paid to producers, and in the final analysis, on the amounts of gas that will be available for use. This in turn can have its effect on the types of equipment which the heating industries will produce in the future—just as past changes in the price and popularity of coal dictated new trends in heating procedures.

In brief, the situation is this: After many years of uncertainty and litigation, the Supreme Court, early in 1954, affirmed the Federal Power Commission's jurisdiction over independent suppliers and gatherers of gas supplies—even though they, themselves, were not engaged in interstate commerce. The FPC had ruled that it has no such jurisdiction, but the courts decided otherwise.

Working to continue the exemption of the producers and gatherers are the gas, oil and coal industries, and members of Congress from producing areas. Representatives from consuming areas take the opposing view. Meanwhile the gas and oil folks are taking large space in Washington newspapers to tell their side of the story to the public and to members of Congress.

These advertisements deny the possibility of a monopoly in gas production; they claim that the proposed regulation of producers' charges by FPC will not hold prices down, and that it may endanger continued supplies of natural gas. Say the gas and oil messages: "Under free competition without federal regulation (1) natural gas became plentiful—output rose two hundred percent in the past 16 years; (2) natural gas stayed reasonable—and gas prices to the consumer rose only one-eleventh as much as living costs in the past 16 years; natural gas has helped create thousands of jobs in industry, and now supplies one-fourth of the nation's energy resources. Now, concludes the message, cumbersome federal controls threaten all this progress.

Whether or not the foregoing is the proper conclusion, the fact remains that Congress has a hot potato to handle in the FPC gas jurisdiction case. Even the White House may have to enter the battle, for it is expected that the subject will be covered in a report by the Cabinet Committee on Energy Resources, named by the President to consider special problems in the field of fuels.

Standby Controls

Taking into consideration the announced desire of the Administration to give business its head as much as possible, it is disturbing to note the attention being paid in Washington to standby controls, mobilization goals, and similar objectives associated with national emergencies.

Two recent indicators point to the need for business to keep its house in order, lest it be caught off base by some unexpected freeze of wages, prices or rents. The first indicator — the Administration has asked Congress for standby authority for the President to control prices, wages, rent and credit in a national emergency. In 1953, the Senate passed a bill giving President Eisenhower such authority, but the House failed to pass the measure after the President indicated he saw no need for it. Reversing that stand, the President has asked that such authority be made a part of the Defense Production Act, scheduled to expire on June 30. He also seeks extension of portions of the act authorizing priorities and allocations controls over materials, special lending and buying authority, and antitrust clearance for industry advisory committees and unpaid industry consultants.

The second indication that standby controls are being taken seriously in Washington is the fact that the Office of Defense Mobilization expects to establish a series of interagency and non-governmental committees to consider and formulate basic standards for such emergency stabilization controls. Although ODM indicates that it may take up to a year to complete the new type of program now contemplated, something quite different from either World War II or Korean controls seems likely. Under the direction of Edward F. Phelps, Jr., Assistant ODM Director for Stabilization, the program is to anticipate both the all-out and the gradual approach. In the event of atomic attack, it is thought that economic controls might have to be applied at the local level, possibly through Civil Defense authorities. To anticipate such a need, ODM expects to develop and distribute to CD officials a basic plan with instructions for its operation.

In addition to the local level programs, ODM plans to have a complete overall program in readiness—just in case.

Minerals Mobilization

Still in the field of potential controls, the Interior Department has announced establishment of an Office of Minerals Mobilization (OMM). The new OMM will be responsible for insuring adequate supplies of certain metals and minerals and facilities to meet military and civilian requirements. The new office will operate in a manner similar to that of the Interior Department's Oil and Gas Division, which is responsible for petroleum and natural gas matters. Heading the new OMM will be Felix E. Wormser, Assistant Interior Secretary for Mineral Resources.

FOR SUMMER COMFORT,

the U. S. National Bureau of Standards rates multiple layers of aluminum FIRST

among all insulations it tested, as reported in its booklet, "Effect of Ceiling Insulation upon Summer Comfort," BMS52. (You can get it at our expense.)

To be comfortable in summer you must ward off unwanted heat rays or radiation. Most heat flow thru a *roof space* in summer is by radiation. There is no convection down, and little conduction thru low density air.

Temperatures can reach over 140° F. in some attics. With an absorptivity for heat rays of only 3%, reflectivity 97%, and emissivity 3%, multiple accordion aluminum is an effective shield against summer heat. The slight mass of its components, air being preponderant, makes it very low in heat storage.

COST OF AIR-CONDITIONING REDUCED

This shield against radiant heat lifts part of the load from house-cooling equipment, reducing installation and up-keep costs. But the building, which is *not* artificially cooled, needs this shield even more!

Multiple accordion aluminum is also markedly effective against radiation through a *wall space.*

Air of higher outside temperatures will support more vapor than the cooler air inside a building. Often vapor flows from the outside to the inside of the house, obedient to the law of physics that vapor travels from areas of greater to less density.

Multiple aluminum has long, continuous metallic sheets on *both* sides which are almost impervious to water vapor. Infiltration under the flat, stapled flanges is slight. The scientific construction of multiple layers of aluminum, fiber and air spaces, minimizes condensation formation on or within this type of insulation. Timber rot, crumbling plaster, peeling paint, etc. are minimized.

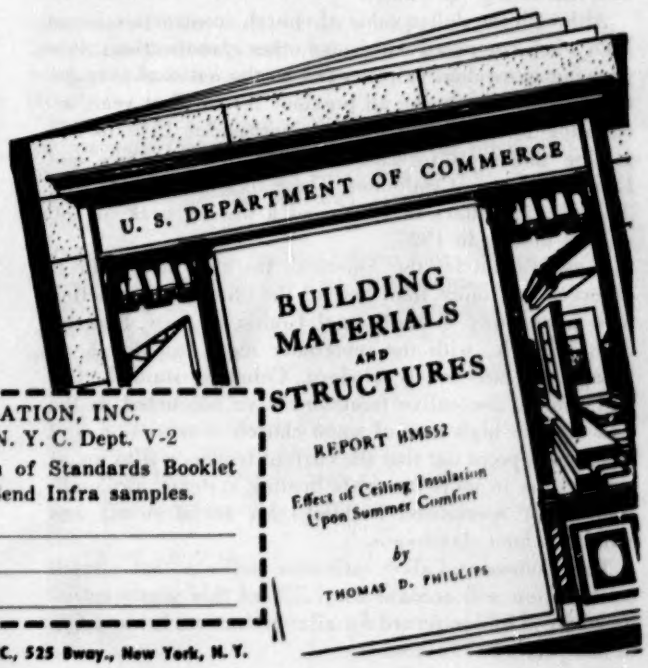
CAUTION: *We do not recommend that vapor barriers be placed on both sides of all insulations.*

IN WINTER, NEED FOR INFRA EVEN GREATER

The low conductivity, the slight heat ray absorptivity and emissivity of multiple accordion aluminum, and the retarding of inner and outer convection by the multiple layers of metal and fiber, amazingly effective in summer, assume paramount importance in winter when this 3-fold bar to outward heat flow cuts fuel bills and increases comfort.

To obtain MAXIMUM, **uniform-depth** protection against heat loss and condensation formation, it is necessary to use the new **edge-to-edge** multiple aluminum*, **each** sheet of which stretches from joist to joist, and also all through the flanges for further vapor protection as well as permanent attachment of each sheet.

*Patent applied for.



COST OF EDGE-TO-EDGE INFRA Multiple Aluminum Insulation installed in new construction between wood joists, material and labor

Type 6-S under 9½¢ sq ft.

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Petroleum Reserve

In another action seeking to make possible immediate action in the event of a national emergency, the Defense Department has asked Congress to authorize standby authority to start production and disposal of petroleum supplies from naval petroleum resources. Navy spokesmen explained that without such authority, 75 or more days might elapse before requirements could be met under existing laws. Elimination of this time lag is the purpose of the request for standby legislation, which would not be used except under emergency conditions.

Each of the foregoing requests for standby authority lends weight to the observation that Washington is thinking in terms of a blitz type of an emergency when, if and as another one develops. The trial and error method of World War II and Korea will be far too slow, it appears. In addition to massive retaliation, something new must be added—instant retaliation. It is to be hoped that instead of either of these methods, the fact of instant readiness may, of itself, be a sufficient deterrent for any who may wish to test our defenses.

Meanwhile, Homes

In the face of all of these very real preparations for some unknown emergency, it is interesting to observe another sector of the economy going about its business undisturbed. The construction industry, thinking in terms of building up rather than destruction, is concerning itself with 1.3 million homes for 1955; with stores, schools, theaters, hospitals and scores of other types of work expected to total $39.5 billion for this year.

Although it is expected that plant and equipment expenditures will be down this year, as well as farm, railroad and utility construction, builders are looking to highways, municipal works, and to two surprise classifications to put the total above the $37 billion total for 1954. One of the surprise classifications, churches, will be of particular interest to those who deal in air conditioning, heating and ventilating equipment.

Although the dollar value of church construction is not high when compared with some other classifications, it is growing more than twice as fast as the national average. Church building broke all previous records last year, accounting for $585 million. An increase of 15% to 675 million dollars is forecast for 1955 by Commerce and Labor department estimates. These figures compare with 250 million dollars in 1948, and a prewar peak of 180 million dollars in 1927.

A spokesman for the American Institute of Architects observes that more than half of the church construction now under way is traditional Gothic or New England Colonial style, with the remainder more functional, although not necessarily modern. Columns, stained glass and similar decorative treatment have accounted in the past for the high cost of some church construction, but spokesmen point out that the current tendency is to invest such extras in more complete heating systems, air-conditioning, or specialized buildings for social rooms and Sunday school classrooms.

The Commerce-Labor estimates indicate that church construction will account for 1.7% of this year's anticipated $39.5 billion record for all construction. It was 1.6% of last year's $37 billion.

The second surprise feature of the 1955 building picture—possibly of less interest to heating and air conditioning folks—is the Census Bureau's discovery that there's a hidden boom in the improvement and maintenance of existing homes. The Bureau's previous estimate for 1954 was $6.6 billion. Based on a study of the first five months of 1954, however, the Bureau is concluding that the actual figure was nearer $12 billion—a total equal to the amount spent for new non-farm residential building last year. About half of the $12 billion, Bureau estimators contend, was do-it-yourself work by home owners.

Washington Miscellany

Vet Housing Extension Asked. Extension of the mortgage insurance provisions of the GI Bill to July 25, 1960 is proposed in a bill presented by Senators Sparkman and Hill, Alabama Democrats. The present law now expires in 1957, and its extension is needed, Senator Sparkman said, to permit many additional thousands of GI's to take advantage of it. Such an extension, he said, would give added stability to the building industry and the entire economy, and would avoid a last-minute rush. The Veterans Administration has underwritten nearly 3,900,000 loans on home, business and farm properties.

Vet Loan Rate Reduction Sought. Reduction of the interest rates on veterans' home loans from 4½% to 4% is sought in a bill introduced by Rep. Albert Rains (D-Ala.), a member of the House Banking Committee.

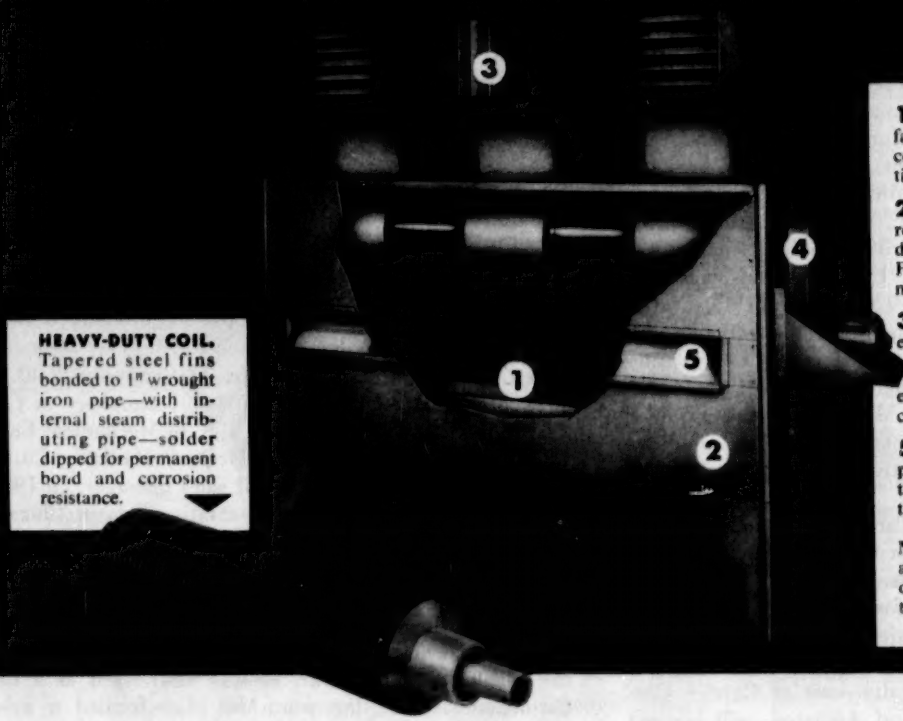
Asbestos-Cement Pipe Studied. The effect of soil exposure on the properties of asbestos-cement pipe are described in a new study completed by the National Bureau of Standards. The Bureau reported that under even the most adverse conditions, the bursting and crushing strengths of all of the samples after exposure were higher than the requirements of federal specifications. Samples were exposed to a wide variety of soil types for periods up to 13 years, after which the pipe was removed and the physical and mechanical properties evaluated.

School Construction Urged. Without awaiting a special school message promised by President Eisenhower for delivery to Congress in February, several bills have been introduced to provide for federal aid to school construction. One bill, submitted by a House Labor Subcommittee, was accompanied by a report warning that the shortage of classroom facilities is a threat to the security and welfare of the nation. The committee bill, presented by Representative Kearns (R-Pa.), chairman of the subcommittee, would provide as much federal aid as needed by states on a matching basis. He estimated about $1 billion in federal aid annually. Another bill would authorize $250 million a year for two years, and in the Senate a bill by Senator Hill (D-Ala.) would authorize $500 million a year for two years. Senator Clements (D-Ky.) submitted a bill to provide federal aid on basis of need, but without specifying the amount.

Inventors Council States Needs. The National Inventors Council of the Commerce Department has issued its second list of technical problems confronting the Armed Services. The new list contains 109 technical problems for which answers are sought. An earlier list, issued in August, 1954, is also available. Both may be secured by writing National Inventors Council, Commerce Department, Office of Technical Services, Washington 25, D. C.

Fact:

Rugged Westinghouse Industrial Heaters available in 24 Sizes . . . 8 Coil Selections . . . 150 Ratings from 100,000 to 2,500,000 BTU/hr . . . 2,000 to 25,000 CFM each



HEAVY-DUTY COIL. Tapered steel fins bonded to 1" wrought iron pipe—with internal steam distributing pipe—solder dipped for permanent bond and corrosion resistance.

1. Proven, Westinghouse-manufactured, extended surface heating coils good for continuous operation up to 200 psig.

2. Die-formed casings with rounded corners eliminate accidents and dirt catching pockets. Front and back panels easily removable.

3. Multiple louvered outlets for efficient distribution of heated air.

4. Self-aligning, grease-lubricated ball bearings mounted outside casing, readily serviceable.

5. Face and by-pass dampers permit continuous air circulation to maintain uniform temperatures.

NOTE: Louver type mixing box accessory permits introduction of fresh air for make-up and ventilation, with or without filters.

Solve your space heating problems with Westinghouse-Sturtevant Industrial Heaters. Eliminate cold, drafty conditions caused by excessive cold infiltration through leakage or exhaust.

Two Types With Wide Applications:

GENERAL PURPOSE HEATER . . . For manufacturing areas, warehouses, garages, commercial buildings—with standard non-ferrous heating coils.

HEAVY-DUTY HEATER . . . For continuous-duty high-pressure systems, or industrial process work—with wrought iron heating coils.

The compact packaged engineering of every Westinghouse-Sturtevant Industrial Heater provides units for mounting on floor, walls, or suspended from ceilings. In short, they can be placed where they will do the most good, and can be relocated to meet any change in plant layout.

Every unit is backed with a Westinghouse exclusive—*one warranty*. Only Westinghouse makes all principal components—Fans, Heating Coils, and Motors. You can get unit engineering and single equipment responsibility.

MORE FACTS? To find out how to solve your particular heating problem, call your Westinghouse-Sturtevant Sales Engineer . . . he is the "Man With The Facts" on heating, air handling, and electronic air cleaning . . . or fill in coupon below.

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YOU CAN BE SURE...IF IT'S

Westinghouse

J-90427

Westinghouse Electric Corp.
Sturtevant Division, Dept. 6A
Hyde Park, Boston 36, Mass.

Please send more information on your Industrial Heaters.

NAME AND TITLE .....

COMPANY .....

CITY ..... STATE .....

BRIEFLY STATED

• Appointment of Rutherford L. Stinard, a New York consulting engineer to the National Panel of Arbitrators of the American Arbitration Association has been announced. Mr. Stinard, who specializes in mechanical and electrical engineering for the building construction industry is a member of the ASHVE and the National Society of Professional Engineers. As a member of the National Panel, Mr. Stinard will be available for selection by parties submitting commercial disputes to arbitration.

• The board of directors of Worthington Corporation has announced the following changes in Company management effective January 1. Hobart C. Ramsey, president, became chairman of the board, succeeding Howard Bruce, who was elected chairman of the executive committee. Mr. Ramsey will continue as chief executive officer. Edwin J. Schwanhausser, executive vice-president and member of the board of directors, became president of the Corporation. Clarence E. Searle is retiring as vice-chairman of the board, but will continue as a director. Mr. Ramsey, a graduate of the United States Naval Academy, joined Worthington in 1920 and has held executive positions in sales, engineering and maufacturing. He became president of the Corporation in 1949. Mr. Bruce has been a director of Worthington since 1921 and chairman of the board since 1929. Mr. Schwanhausser joined Worthington in 1915, was elected to the board of directors in 1942 and became executive vice-president in 1949.

• The program for merging Carrier Corp. and Affiliated Gas Equipment, Inc., has been approved by the boards of directors of the two companies, subject to legal requirements including ratification by stockholders. Present plans are that the two major operating divisions of Affiliated Gas Equipment, known as Bryant and West Coast, will become operating divisions of Carrier Corporation. L. C. Harvey, head of Affiliated, will become senior vice-president and a director of Carrier upon completion of the merger.

• Corrosion problems in the power and communications industries will be discussed in four papers to be presented at the Power and Communications Symposium, at the Eleventh Annual Conference of the National Association of Corrosion Engineers, March 7-11, 1955, at the Palmer House, Chicago, Illinois. The symposium will be held at 2:00 P.M., March 9. Titles of the four papers to be delivered are: Atmospheric Galvanic Couple Corrosion, by K. G. Compton, A. Mendizza and W. W. Bradley, all of Bell Telephone Laboratories, Inc., Murray Hill, N. J.; Corrosion on the Florida Keys, by R. W. Ackerman, American Telephone & Telegraph Company, Cincinnati, Ohio; Carbon Anode Installed in Electric Cable Conduit, by H. L. Davis, Jr., Philadelphia Electric Co., Philadelphia, Pa.; and The Use of Half Cells for Field Corrosion Testing, by Robert Pope, Quakertown, Pa. A Cathodic Protection Symposium, a Protective Coating Symposium, A Cathodic Protection Clinic and a General Corrosion Roundtable are among the other subjects on the technical program.

• A course in air pollution is being offered for the second year by the Institute of Industrial Medicine of the NYU Post-Graduate Medical School, a unit of New York University-Bellevue Medical Center, in cooperation with NYU College of Engineering. This year's course, scheduled from February 10 through May 26, 1955, will meet once a week for fifteen weeks. New York University's Division of General Education will offer four adult evening courses in heating, refrigeration, and air conditioning during the spring, 1955 term.

• The Van-Packer Corp., manufacturers of packaged masonry chimnies, has moved its home office into recently-completed quarters at Bettendorf, Iowa. Formerly, the Van-Packer main office was located at 209 S. LaSalle St., Chicago, Ill. The new office facilities at Bettendorf are part of a general expansion program. The firm's central manufacturing plant is located at Buda, Ill.

• Maxwell F. May has been appointed vice-president and general sales manager of the Fitzgibbons Boiler Company, Inc., according to an announcement by Paul K. Adams, president. Mr. May succeeds John A. Darts who recently announced his retirement after having been associated with Fitzgibbons for 43 years. Mr. May, who will make his headquarters at the Fitzgibbons General Offices in New York, has been the Fitzgibbons Metropolitan Chicago district sales representative since 1948. A graduate of the Armour Institute of Technology in Chicago in 1922 with the degree of B.S. in Mechanical Engineering, Mr. May joined the McQuay Radiator Co. in 1927 and rose to the position of sales manager. In 1930, he formed his own sales representative firm in Chicago and in 1933 accepted the appointment of sales manager of the Young Radiator Co., Racine, Wis. Subsequently, he was named vice-president and served in that capacity until 1942 when he entered the U. S. Navy in the Office of Procurement and Material, Chicago Naval District. At the conclusion of the war, he was discharged as a Lt.-Commander. After the war, Mr. May formed a sales agency for heating and air conditioning equipment, re-establishing his connection with Fitzgibbons.

• Minneapolis-Honeywell Regulator Co. has purchased all of the outstanding capital stock of Doelcam Corp. of Boston, Mass., manufacturer of precision instrument and control equipment for aircraft and industry uses. The New England firm, which has a main plant and administrative offices in Boston and another plant and engineering laboratories in Newton, Mass., will be operated as a new division of Honeywell. There will be no change in the management, headed by John J. Wilson, president and founder of Doelcam.

• Three new Chrysler Airtemp engineering division appointments have been announced. P. W. Wyckoff has been named chief engineer of the Airtemp Division. Until his new assignment he has held the post of assistant chief engineer. R. L. Brugler has been named assistant chief engineer in charge of design operations, and R. W. Kelto, assistant chief engineer in charge of laboratory operations, filling two newly created posts.

(*Concluded on page* 10)

Newer than new...Sill-line for '55

Get the full story on
Nesbitt Sill-line Radiation.
Send today for Publication 102.

When Nesbitt Sill-line Radiation was brand new—a few years ago—it startled the industry by its functional ingenuity, imaginative artistry, and recordbreaking ease of installation . . . but as Nesbitts continuing engineering has found ways of further increasing these advantages to you, the contractor, these later improvements have been incorporated for 1955.

Today's Nesbitt Sill-line is the most advanced form of perimeter radiation—applicable with the greatest known ease and economy—evidence of a dynamic manufacturing policy.

FEATURING—

1. Re-styled front panel with attractive curved louvre grille and extruded bottom inlet looks well from any angle, any height. Above eye-level installations do not require inverted mounting or special enclosures.

2. One piece back panel, formed of 20-gage steel for maximum strength and rigidity, is prepunched for simplified installation without additional wall attachments.

3. Top and bottom interlocks of back panel support front panel for entire length of the ensemble. Permanent alignment assured.

4. Adjustable hanger brackets support heating element, provide for vertical adjustment for pitch and longitudinal movement for expansion and contraction.

5. Corrugated aluminum fins are damage resistant, easier to handle and install. Sized-to-mate tube ends permit quick end-to-end sweat jointing without couplings.

Seven standard lengths of casing and heating element combine to any room length —without cutting on the site—through use of telescoping, overlapping sleeves.

Full range of sizes, 2′ to 8′, in four cabinet types. Capacities from 2.9 to 11.1 sq. ft. EDR. Complete accessories to meet all practical installation needs. (See below.)

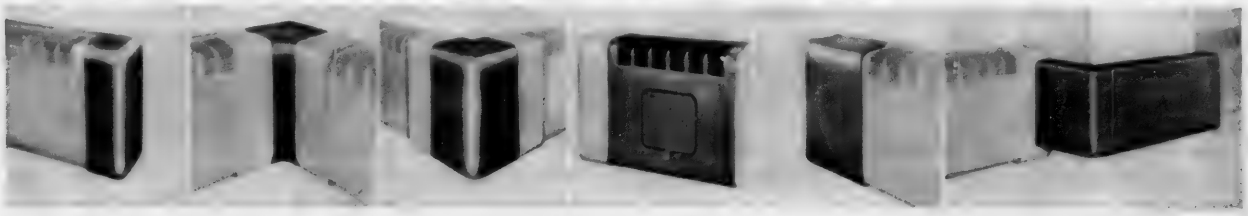
Optional equipment include knob-operated blade dampers, Nesbitt steam-distributing tubes for uniform heating with modulating control, and off-set adapters for convenient and economical steam trap connections.

Separate packaging of enclosures, heating elements and accessories facilitates selection, distribution and handling; offers the maximum protection from damage.

Nesbitt Sill-line Radiation

MANUFACTURED AND SOLD BY JOHN J. NESBITT, INC., PHILADELPHIA 36, PENNSYLVANIA

End Caps | 90° Inside Corner | 90° Outside Corner | Valve Compartment | Sleeves | Column Enclosure



Briefly Stated (*Concluded from page 8*)

• William A. Meiter, central sales manager of Worthington Corp., has been promoted to general sales manager. Mr. Meiter will succeed Mr. Kehane who has been appointed vice-president in charge of sales. A graduate of Ohio State University with a mechanical engineering degree in 1927, Mr. Meiter joined the Worthington training class of that year. He served as a sales engineer and later was named manager of the Buffalo district sales office. In 1950 he became central sales manager.

• Purchase by Revere Copper and Brass Incorporated of substantially all of the assets of Standard Rolling Mills Incorporated, successful producer and marketer of aluminum foil products since 1926, with plants in Brooklyn, Chicago and Newport, Arkansas, has been announced by James M. Kennedy, Revere's board chairman and chief executive officer, and Charles A. Macfie, president. The new Revere Division employs approximately 500 people and had a gross profit before taxes in 1953 of $500,000. Joseph H. Konigsberg, who has been associated with Standard Rolling Mills since 1926 and who has been its president since 1938, has been elected a vice-president of Revere and will continue to supervise the activities of the new Division. The present personnel of Standard Rolling Mills, including its sales staff, will also be retained.

• A basis for merging The National Radiator Co., Johnstown, Pa., and United States Radiator Corp., Detroit, Mich., has been approved by directors of both companies. Stockholders will be asked to approve the merger at special meetings. National Radiator had sales of $20,569,000 for the fiscal year ended March 31, 1954, with a net profit of $856,400. United States Radiator for its fiscal year ended January 31, 1954, reported net sales of $29,576,000 and a net loss of $42,400. While both are manufacturers of equipment for the domestic and commercial heating industry, both have substantial diversified activities in other fields.

• S. W. Brown, former chief engineer of the marine department of Carrier Corp., has opened his own business as a consulting engineer with offices in the Chrysler Building, New York City. The firm will specialize in the design and application of air conditioning and refrigeration systems. Mr. Brown was associated with the engineering and design of refrigerating or air conditioning systems on all but one of the passenger ships constructed in the United States following the termination of World War II.

• Frank C. Hawk, vice-president in charge of sales of the Brunner Manufacturing Co., Utica, has announced the appointment of Wallace C. Roberts as advertising and sales promotion manager. Mr. Roberts, a native of Utica, was formerly advertising manager and assistant sales manager of the American Emblem Company of New Hartford, N. Y. He served three years in the Marine Corps during World War II and after five years in the newspaper business, he became associated with the Utica public relations firm of Ball & Grier, Inc.

• The Cast Iron Soil Pipe Institute reelected its officers for another term in 1955, it was announced recently. Those named were Frank T. Hamilton, Anniston, Ala., president; Philip J. Faherty, Lambertville, N. J., vice-president; and Deems W. Hallman, Quakertown, Pa., treasurer. Homer E. Robertson, Washington, D. C., was re-appointed executive vice-president of the group.

• George F. Robinson, former manager of Carrier Corp.'s St. Louis unitary equipment branch sales office, has been named assistant sales manager, residential air conditioning, with headquarters in Syracuse, N. Y.

• The election of Glenn P. Bakken, of Phoenix, Arizona, as director and executive vice-president of Chase Brass & Copper Co. Inc., a subsidiary of Kennecott Copper Corp., has been announced. Mr. Bakken succeeds Wallace C. Husted, who retired September 1, 1954. Mr. Bakken is a native of Minneapolis and was graduated from the University of Minnesota in 1942 with the degree of B.S. in mechanical engineering. He has had supervisory positions with Aluminum Co. of America and Reynolds Metals Co.

• Albert J. Reed, former senior research engineer, The Carborundum Co., has been elected director of research of the National Clay Pipe Research Corp., an organization of the vitrified clay pipe industry wholly engaged in clay pipe research developments, product improvement and study of health-protecting sanitary lines of clay pipe and kindred products. Mr. Reed received his early education in Ohio. He holds a Bachelor's degree in ceramic engineering from Ohio State University. In 1943 he joined the Harbison-Walker Refractories Co., where he took advanced training at Hays Research Laboratory, Pittsburgh. In 1946, Mr. Reed joined the Carborundum Company as a development engineer, where he carried out various research and development projects in ceramic bonded abrasives.

• Prat-Daniel Corp. announced the appointment of Richard F. Sharon as manager of the Corporation's Thermobloc Division. Mr. Sharon joined Prat-Daniel in 1949, and in May of 1951, was named chief engineer of the division, the position he held until his recent appointment.

• According to an announcement by M. Nielsen, vice president in charge of The Babcock & Wilcox Company's Boiler Division, a new department has been formed in the division which consolidates the contract and erection phases of the division's operations. The new department, to be known as Contract and Erection, will be located in a new modern office building soon to be built a short distance away from the company's largest manufacturing plant in Barberton, Ohio. At the same time, Mr. Nielsen revealed that Laurence W. Hayward, former assistant chief engineer of the division, had been named manager of the new department. R. W. Fox, contract manager and J. P. Craven, erection superintendent will continue to be in charge of these respective functions, under Mr. Hayward.

• Dr. Max Jackob, 75, one of the world's foremost authorities on heat transfer and thermodynamics, died suddenly of a heart attack Jan. 4 at his home in Chicago.

Pliotron—T.M. The Goodyear Tire & Rubber Company, Akron, Ohio

NEW HIGH EFFICIENCY

ELECTROSTATIC AIR FILTER

PLIOTRON is its name. It's the world's first washable, self-charging electrostatic filter.

This new air filter actually attracts and captures up to five times as many fine particles as ordinary, non-electrostatic filters as proved by the Weight/Smoke test. It picks up particles as small as some of the solids in cigarette smoke.

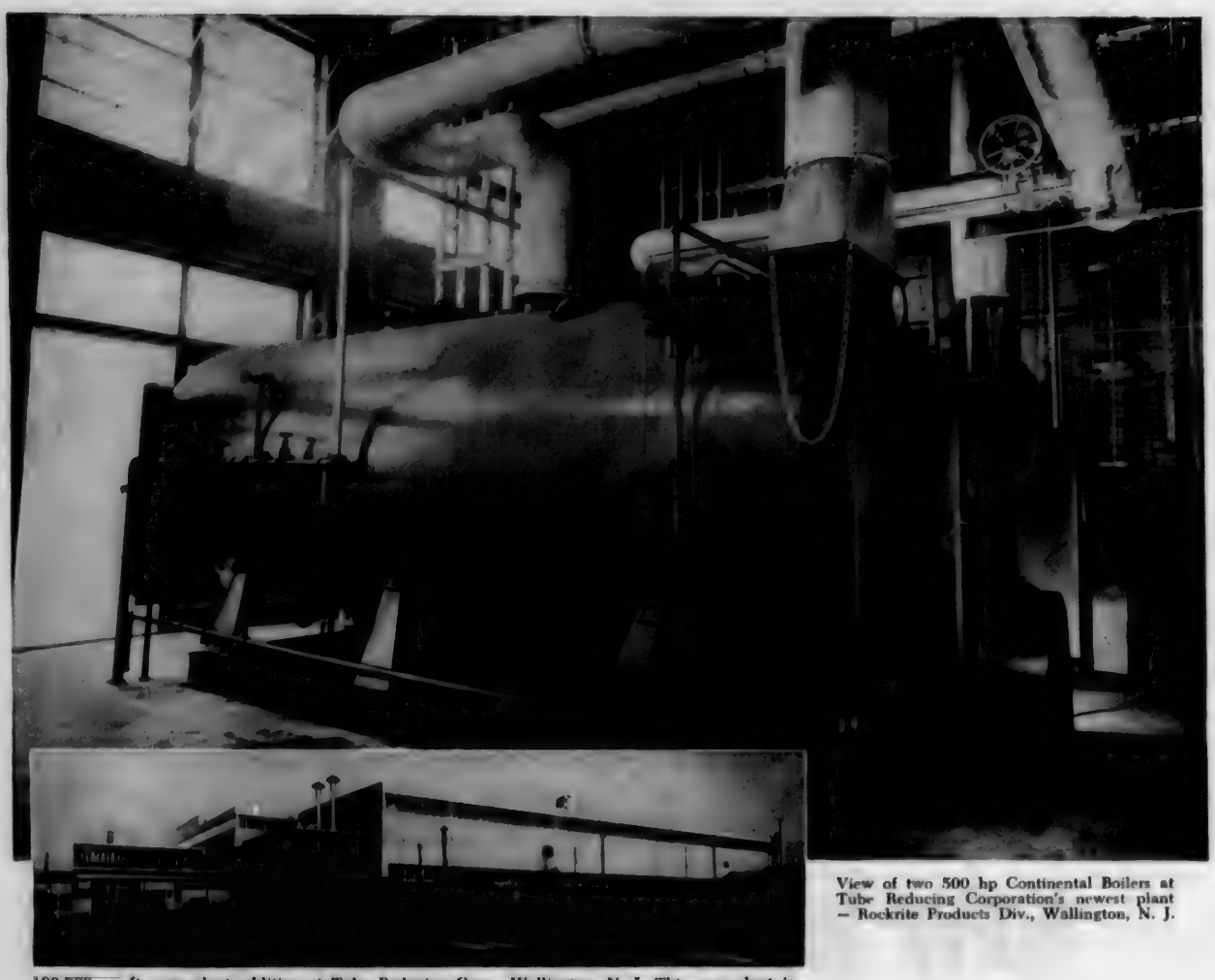
PLIOTRON looks and installs like regular replacement filters. It slips into standard filter holders in most heating or air conditioning systems. But there the similarity ends. Its permanent, natural static electric charge gives you an efficient cleaning action that does not wash off or wear away. And when it's dirty, a quick bath restores it to "like new" efficiency. All this adds up to cleaner, healthier air longer and at lower cost.

PLIOTRON has been proved in laboratory tests and actual use. Reports from the field indicate it is doing an outstanding job of removing not only dust, soot and pollen, but also such diverse materials as diamond dust, air-borne spores and bacteria from the air. Whenever you need clean air, put in PLIOTRON. Get full details from your heating or ventilating distributor or by writing Goodyear, Pliotron Sales, Akron 16, Ohio.

GOODYEAR

THE GREATEST NAME IN RUBBER

We think you'll like "THE GREATEST STORY EVER TOLD"—every Sunday—ABC Radio Network—THE GOODYEAR TELEVISION PLAYHOUSE—every other Sunday—NBC TV Network



View of two 500 hp Continental Boilers at Tube Reducing Corporation's newest plant — Rockrite Products Div., Wallington, N. J.

100,000 sq. ft. new plant addition at Tube Reducing Corp., Wallington, N. J. This new plant is sponsored by the U. S. Navy, Bureau of Aeronautics. Consulting Engineers: Lockwood & Greene, New York, N. Y.; Heating Contractor: Frank A. McBride, Paterson, N. J.; Builder: James Stewart Corp., New York, N. Y.

CONTINENTAL BOILERS

. . . known by the company they keep

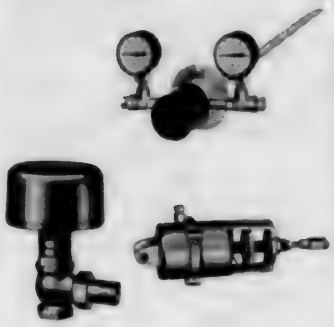
These twin 500 hp Continental Boilers are installed in a new plant that is the last word in modern efficiency — Tube Reducing Corp., Rockrite Products Division, Wallington, N. J. Besides furnishing steam for processing, they are supplying more than enough steam to heat the 100,000 sq. ft. new plant addition. They serve efficiently the men and machines that produce Rockrite Tubing — a precision product for military and industrial applications.

The Continental is the packaged boiler that features the "spinning gas technique". A forced draft fan delivers air to concentric rows of guide-vanes which direct the air in a spinning stream into the burner. These vanes form, in effect, a multiple-lead air-screw that provides uniform delivery of air and thorough mixing of air with fuel. The result: a high rate of heat transfer to the surrounding water-cooled furnace.

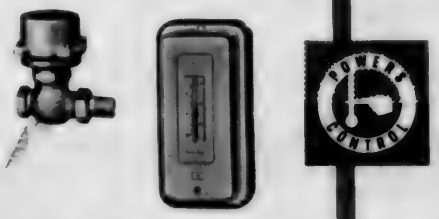
For details on Continental Boiler's "Spinning Gas Technique", send for Bulletin BE-4A.

BOILER ENGINEERING & SUPPLY COMPANY, INC.

Phoenixville, Pa.

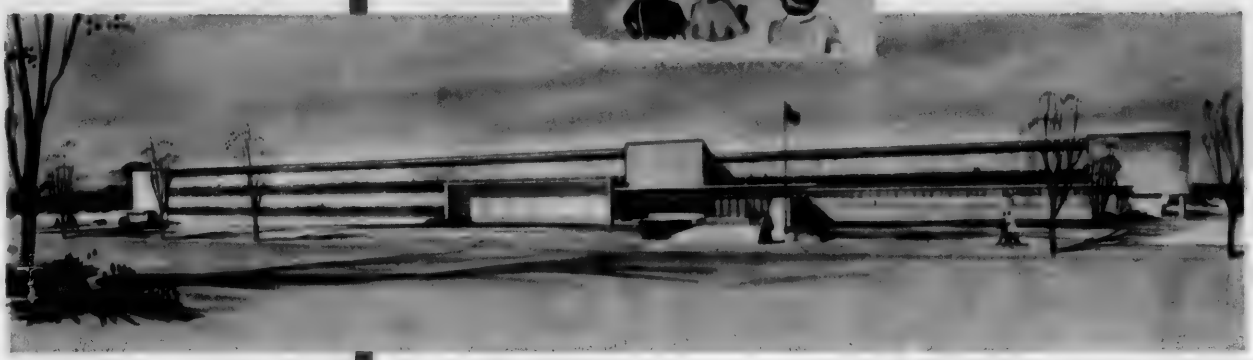


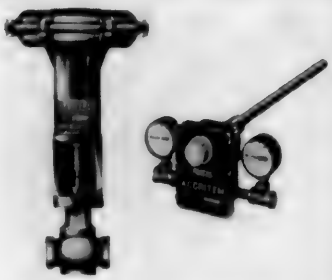
Powers Packless Control Valves Eliminate packing maintenance and prevent leakage of steam or water.



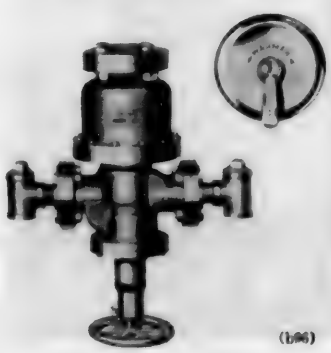
ARCHITECTS: Grassold-Johnson and Associates, Milwaukee, Wis.
ASSOCIATED WITH: The Board of School Directors, Fred E. Wegner, Architect
CONTRACTORS: Heating, S. V. Hanley Co. • Plumbing, Kuetemeyer Plbg. & Htg. Co.

Northwest Senior High School **Milwaukee's new "school of the future"**





Only a few Powers Controls for heating systems, shower baths and water heaters are shown here.



(b96)

POWERS *Automatic Temperature Control*

is being installed throughout this modern $4,500,000 building

For the classrooms and other heated and ventilated spaces Powers control will provide utmost comfort and fuel economy with lowest operating and maintenance cost. Some Wisconsin schools using Powers systems report dependable operation after 30 to 50 years.

Powers individually controlled shower baths and groups of lavatories and gang showers will be unsurpassed for safety, comfort and economical use of water.

Powers controls, on hot water service heaters and swimming pool heater, will prevent waste of fuel from overheated water and give years of dependable service.

You, too, Can Solve Most of Your Temperature Control Problems with Powers — one dependable source, one responsibility. Consult Powers on all temperature control problems. Our more than 60 years of experience will save time and help you get the right control for your requirements.

THE POWERS REGULATOR COMPANY

SKOKIE, ILLINOIS • *Offices in 60 Cities in the U. S. A., Canada and Mexico*

STOP *using water!*

Eliminate all water problems with UNICON by KRAMER. Any size compresser, regardless of tonnage, can be air-cooled with UNICON.

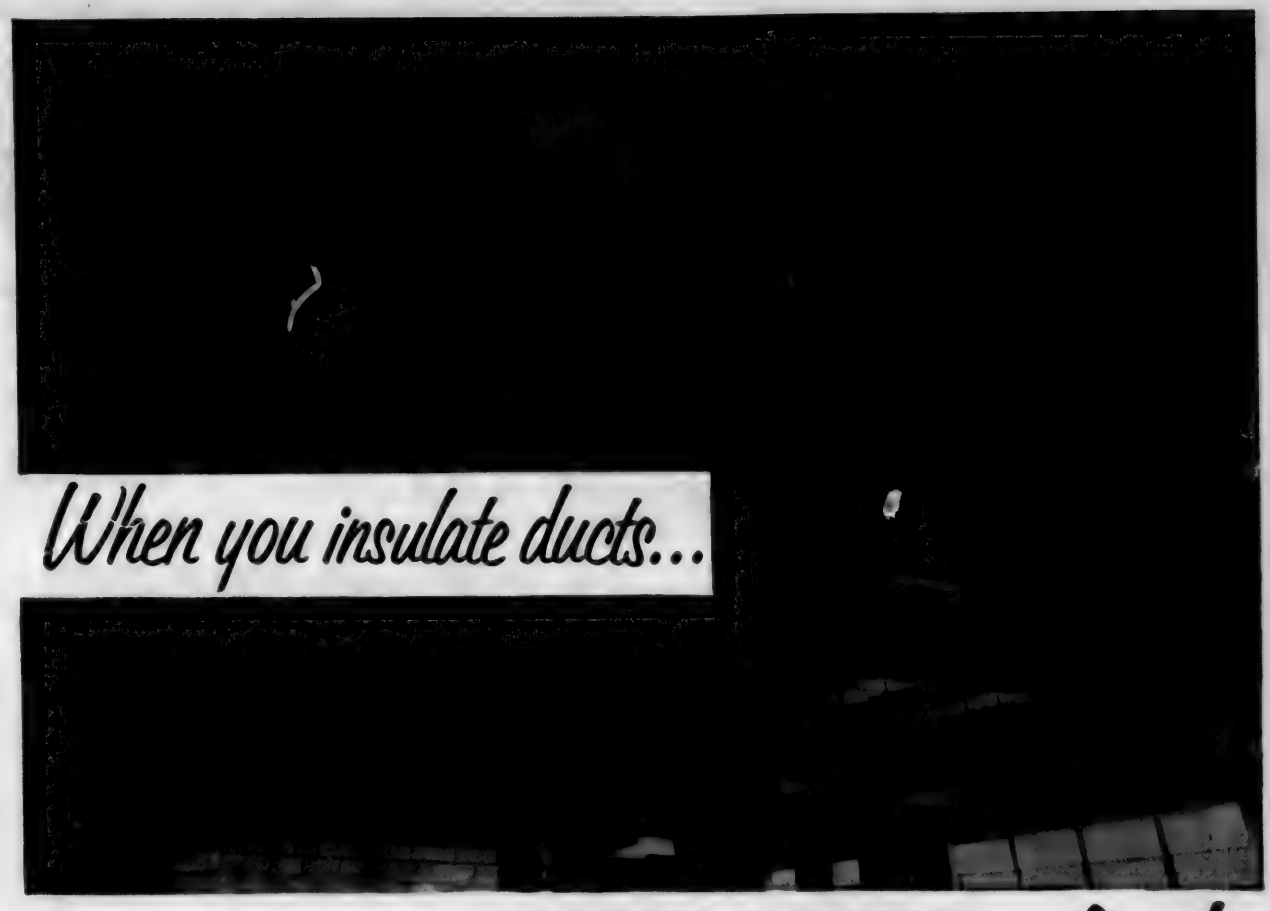
KRAMER **UNICON**

Stands, hoods, and wind deflectors are available for simplified outside mounting

You need nothing else!

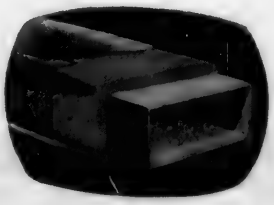
WRITE FOR BULLETIN U-210C

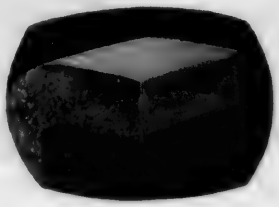
KRAMER TRENTON CO. • Trenton 5, N.J.



think of ULTRALITE...*first!*

When you want *performance* you can count on — and prompt *delivery* you can count on — specify ULTRALITE, the only insulation of long glass fibers!





first flexible duct insulation of fine glass fibers on the market! Only Ultralite, introduced in 1945, has a 10-year record of completely satisfactory performance — without losing thickness or thermal efficiency.

first flexible duct insulation of fine glass fibers available with factory-applied vapor barrier. Ultralite is still available plain or with a wide choice of facings — some for appearance, some as vapor barriers.

first flexible glass fiber insulation to spring back to full original thickness every time after being compressed!

first flexible duct liner of fine glass fibers. Recent examinations of Ultralite Duct Liner installed 7 years ago show no indications of air erosion.

first flexible duct liner on the market with spray coating (1948).

first flexible glass fiber insulation available nationwide at convenient stocking points for immediate delivery. And ULTRALITE is still available *more* readily, in *more* cities, than any other glass fiber insulation!

Ultralite distributors are listed in the Yellow Pages in 97 Cities.

GUSTIN-BACON *Manufacturing Company* gb

Molded glass fiber pipe insulation • Pipe coverings and fittings • Thermal and acoustical insulations

222 W. 10th St., Kansas City, Mo.

Clean Air by the

The magic ROLL-O-MATIC!

Front view of automatic self-cleaning air filter consisting of two 5′0″ wide by 8′0″ high sections having a total capacity of 26,700 cfm. The renewable media filtering curtain, mounted in roll form at top of each section, moves down the face of the filter and is re-rolled at bottom.

AAF
Herman Nelson

YOUR MAINTENANCE MAN IS A MOTOR!

Controlled by an automatic time switch, this single motor supplies the power for both introducing sufficient clean media to maintain desired operating resistance and for re-winding the dirt laden material.

READY TO ROLL!

Free end of fiber glass filtering curtain is attached to driven spool at bottom of filter which re-rolls the used material for later disposal. Note thickness of material in the filter curtain.

A YEAR'S SUPPLY OF CLEAN AIR!

Pictured is a standard 70 ft. length of filtering material for a 5 ft. wide ROLL-O-MATIC section. When rolled on spool, it forms a compact, easy-to-handle package only 13″ in diameter.

B E T T E R A I R I S O U R

ROLL!

Roll-O-MATIC

writes a new chapter in maintenance-free, low cost air filter operation

Once-a-year air filter maintenance is no longer a "dream". ROLL-O-MATIC makes it a reality with the renewable media filtering curtain supplied in roll form.

This is no ordinary filtering curtain. It's a "blanket" of bonded glass fibers possessing the high cleaning efficiency, dust holding capacity and velocity rating of a viscous filtering media. But, unlike such media, it is sufficiently resilient and flexible to permit packaging 70 ft. lengths in compact 13" diameter rolls.

Equipped with this versatile media, ROLL-O-MATICS are setting new high standards for maintenance-free operation—a fact verified by field reports which indicate that a single roll of this low cost material represents a *year's supply* per 18,000 cfm capacity under normal operating conditions. This means that, in addition to the man-hours saved through reduced maintenance, ROLL-O-MATICS are operating at less than half the cost of disposable type filters of equal capacity.

"Clean air by the roll" is the most significant air filter development of the past decade. For complete technical data on the ROLL-O-MATIC, call your local AAF representative, now, or write for Bulletin No. 248.

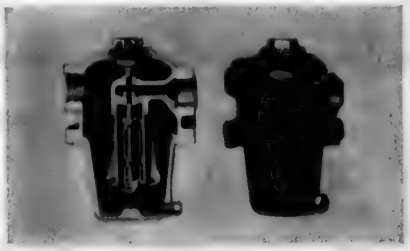
American Air Filter
COMPANY, INC.

294 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

B U S I N E S S

OTHER AAF herman nelson PRODUCTS

AAF Type D ROTO-CLONE—designed for the dry collection of granular dust. One of five basic types in AAF's complete line of dust control equipment. Ask for Bulletin 270.



Illinois Float and Thermostatic Traps—made in three series for operating ranges from 50 pounds pressure to 25 inches vacuum. Ask for Bulletin 27.

herman nelson propeller-fan type unit heaters for use with steam, hot water or gas. Ask for Bulletins 700 and 715.

American Air Filter Company, Inc.
294 Central Avenue, Louisville 8, Ky.

I would appreciate receiving catalogs describing the following equipment—

- ☐ *Roll-O-MATIC* Air Filters (248)
- ☐ ROTO-CLONE Dust Control Units (270)
- ☐ Illinois Traps (27)
- ☐ *herman nelson* Unit Heaters (700-715)

Name_____

Company_____

Street_____

City_____ State_____

Now! Push-button air conditioning with...

Trane CenTraVac® for runs automatically

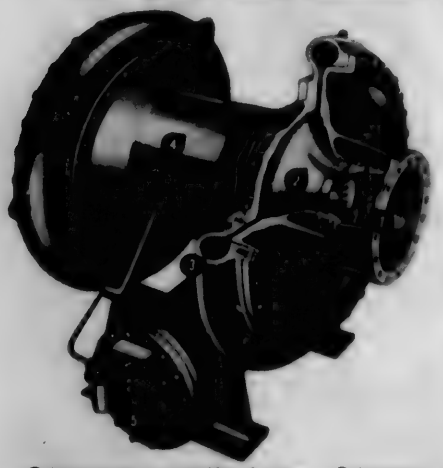
Fully automatic refrigeration unit, up to 400 tons capacity, starts at the touch of a button. Exclusive hermetic design and control system eliminates hours of purging and checking shaft seals before start-up, simplifies cooling system operation.

No shaft seals to cause Freon loss or require constant maintenance! No external drive. All working parts hermetically sealed inside housing. *CenTraVac Freon charge guaranteed for one full year!*

Only one major moving part! Only *two* main bearings! Operates only when full oil pressure is applied to *both* bearings. *For dependability!*

No costly multi-level base required. May be set directly on a level concrete floor of sufficient strength to

Compare these exclusive features



1. Variable inlet vanes.

2. Nonferrous impeller with radial blades.

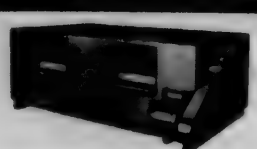
3. Volute housing. Carefully machined gas passages insure smooth gas flow.

4. Hermetically sealed motor.

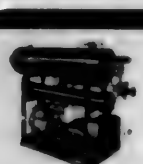
5. Forced-feed lubrication system. Pump located below normal oil level — assuring oil supply.

- **Most modern** centrifugal compressor in the industry . . . gives added insurance against obsolescence for years to come.
- **The only hermetic** centrifugal design. All working parts inside. Eliminates gearbox, expensive variable speed motor, shaft seals . . . saves up to 10% power costs.
- **Matches capacity to load** smoothly from 100% to 10% of capacity . . . saves power . . . boosts efficiency.
- **Unrivaled dependability** . . . longer service—only *one* major moving part.
- **Smoother control** . . . exclusive variable inlet vanes give finer modulation.

Here's how CenTraVac cuts operating costs. TRANE CenTraVac modulates from 100% down to 10% of capacity—*with power savings in almost direct proportion!* Now in 8 sizes, 45 to 400 tons capacity.



TRANE Climate Changers—full line of factory-assembled air conditioners. 600 to 29,000 cfm.



TRANE Cold Generators—packaged water chillers from 10 to 100 tons capacity.

chilling water...starts, stops, ...no special attendant needed

support its weight. No foundation bolts or reinforcing needed. Saves up to $800 on installation costs.

Lower operating costs! CenTraVac automatically adjusts to varying cooling needs from 100% to 10% of capacity—with power savings in *almost direct proportion* to load. Saves up to 8% power compared with 4-step capacity control reciprocating compressor. Hermetic design eliminates power-wasting gearbox and expensive variable speed motor, thus producing outstanding economies in power consumption. Users are assured of substantial savings . . . *plus* years of trouble-free operation!

For complete information on TRANE CenTraVac and the complete TRANE line of air-conditioning equipment, call your nearest TRANE Sales Office or write TRANE, La Crosse, Wis.

one source · one responsibility

TRANE

Refrigeration Equipment

for more dependable . . . lower cost air conditioning

MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING, VENTILATING AND HEAT TRANSFER EQUIPMENT

The Trane Company, La Crosse, Wis. · East Mfg. Div., Scranton, Penna. · Trane Co. of Canada, Ltd., Toronto · 90 U. S. and 14 Canadian Offices

Modernized H. J. Heinz service building demonstrates how to

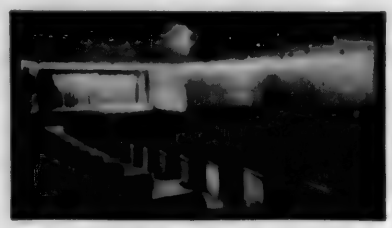
Give your clients Ideal Indoor Weather when they remodel

Why Honeywell Customized Temperature Control is a "must" in modernized buildings

WHETHER your clients build new or remodel, the object is to provide the best possible facilities and working conditions—of every kind.

Proper year-round temperature and humidity (Indoor Weather) go a long way to create better working conditions.

And the best way to assure this is to *install Honeywell Customized Temperature Control.*



Controls in the renovated Heinz service building auditorium help provide ideal Indoor Weather—no matter how large or small the gathering for an event.

That's the big reason why the remodeled service building of the H. J. Heinz Company in Pittsburgh features it. The service building provides locker rooms where employees change clothes, an auditorium for large gatherings, cafeteria space and many other "service" facilities.

In the control installation, Honeywell thermostats and humidistats control fan systems, heating and cooling coils and humidifiers—compensating for occupancy, exposure and use factors. More on these important factors will be found in the captions.

The *techniques* used in the Heinz service building, applied to your particular problems, can help you provide the Indoor Weather required for your clients' facilities—customized to their needs.

The key word here is "customized." It means that whatever your clients' control requirements, a Honeywell Customized Temperature Control installation *designed to fit the needs of the building and its occupants* is your answer. This applies not only to heating and cooling, ventilating and humidity control, but to industrial control as well.

Only Honeywell can provide true "customized" control—for new or modernized buildings. Because only Honeywell manufactures all three types of controls—electronic, pneumatic and electric.

Occupancy. Separate thermostats in the cafeteria provide ideal comfort by calling for more heating or cooling—depending on the number of occupants. They also easily meet special comfort problems such as compensating for heat from steam tables. Separate thermostats, too, provide comfort in locker rooms where the internal cooling load may be raised by the influx of hundreds of people in a few minutes' time.

Architects and engineers: Skidmore, Owings & Merrill. Mechanical engineers: Jaros, Baum & Bolles. General contractor: George A. Fuller. Heating, piping and air conditioning: Baker Smith & Co., Inc.

FIRST FLOOR PLAN

Service Building (Modernization)

Exposure. Part of the reason why Honeywell Customized Temperature Control provides ideal comfort is its ability to compensate for exposure factors. Much of the wall space of the large lobby below has a northern exposure. Heat loss is greater here than in other parts of the building. Yet strategically placed thermostats keep not only the lobby but every part of the building comfortable. Buildings in addition to the service building equipped with Honeywell Customized Temperature Control include the vinegar and office buildings.

For comfortable, even temperature in new or existing buildings—of any size—specify Honeywell Customized Temperature Control

Whether it's an office, motel, hospital, factory—any building of any size—new or existing, Honeywell Customized Temperature Control can help meet your clients' heating, ventilating, air conditioning and industrial control problems. You can give your clients more comfort and efficiency, and they'll save fuel, too.

For full facts on Honeywell Customized Temperature Control, call your local Honeywell office. Or mail the coupon today.

MINNEAPOLIS
Honeywell

Customized Temperature Control

112 offices across the nation

MINNEAPOLIS-HONEYWELL REGULATOR CO.
Dept. HV-2-16, Minneapolis 8, Minnesota

Gentlemen:
I'm interested in learning more about Honeywell Customized Temperature Control.

*Name*_____

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*City*_____ *Zone*____ *State*_____

IS YOUR REPUTATION AT STAKE ON THIS JOB?

Make-shift or hit and miss piping systems are not only costly in corrections and repairs . . . but certainly reflect on the ability of the mechanical engineer. It is *not* necessary to gamble on an efficient, long lasting insulated piping system. RIC-WIL's forty-five years in the Insulated Piping Field is your assurance of the finest piping system for both overhead and underground use. Specify RIC-WIL and be sure of the results.

For complete technical information contact your nearest RIC-WIL field representative or send for the RIC-WIL catalog.

Quality Piping Systems of the . . .
. . . Highest Thermal Efficiency

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PREFABRICATED INSULATED PIPING SYSTEMS

BARBERTON, OHIO

MYERS...

tops in domestic pumps,

ANNOUNCES

a complete line of centrifugals for air-conditioning application

FULL RANGE OF SIZES
⅓, ½, ¾, 1, 2, and 3 horsepower, motor-mounted or belt-driven models.

TWO CASING SIZES
1″ x 1¼″ or 1¼″ x 1½″.

ALL-BRONZE IMPELLER
Accurately balanced for smooth operation.

REMOVABLE BRONZE WEARING RINGS
Easily replaced for longer pump life.

ROTARY SEAL
Eliminates leakage (stuffing box may be specified on some models).

CORROSION-RESISTANT SHAFT
Stainless steel for trouble-free service.

CAPACITOR-TYPE MOTORS WITH BUILT-IN OVERLOAD PROTECTION
Available in single or dual voltage for single or 3-phase current.

WIDE RANGE OF CAPACITIES AND HEADS
Model with capacities to 85 GPM and heads up to 135 feet.

Myers

Write today *for performance curves and Bulletin M-787 on Myers Centri-Thrift Pumps.*

Myers **PUMPS** WATER SYSTEMS AND WATER SOFTENERS

The F. E. Myers & Bro. Co. • Dept. HV-2, Ashland, Ohio

American Blower Supply and Exhaust Fans help to create an ideal indoor climate in modern Terminal Building at San Francisco International Airport. Architect: W. P. Day, San Francisco. Mechanical Contractors: Anderson & Rowe, Inc., San Francisco.

Why San Francisco Air Terminal

Powerful, quiet-operating American Blower Supply and Exhaust Fans circulate filtered air through Terminal.

Ventilating system also includes American Blower Heating and Ventilating Units (above), Heating and Cooling Coils, Utility Sets.

Serving home and industry: **AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL**

Geo. D. Burr, San Francisco Utilities Commission Design Engineer for airport, tested American Blower Fans; rates them "excellent."

Clyde E. Bentley, consulting engineer says "American Blower Fans are dependable; meet conditions required for top performance."

uses American Blower Fans

New $14 million Air Terminal Building accommodates up to 16,000 passengers a day—in *comfort,* thanks to powerful American Blower air-handling equipment!

SAN FRANCISCO's new International Airport is the nation's third largest, accommodating up to 16,000 passengers a day in its modern six-story Terminal Building, concourse and food-service areas—which include two restaurants, a cocktail lounge and cafeteria.

Refreshing Atmosphere Maintained

Yet, even when traffic is heaviest, the indoor climate in the airport terminal is refreshing and pleasant. For engineers have seen to it that stale air is continually exhausted—and replaced with country-fresh air from outdoors.

Plans called for a ventilation system to service the entire airport—one that would supply an even flow of filtered fresh air, and at the same time give efficient, quiet performance with low upkeep. American Blower equipment was chosen for this important job on the basis of quality and performance.

Fifty powerful American Blower Fans are used in the system, with about 1000 air outlets. Thirty-four fans service the Terminal Building with its main waiting room and offices—a total of 317,000 sq. ft.—and together have a capacity of 265,000 cfm. Seven American Blower Fans are used to ventilate the concourse, which has a floor area of 150,000 sq. ft. Nine others are used to circulate fresh air in the food-service areas.

Call on American Blower

American Blower Fans are used extensively in business and industry for ventilating, air conditioning, drying, heating, fume removal and processing systems. If you'd like the complete story on American Blower air-handling equipment, give your nearest American Blower Office a call, today.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN • CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary Corporation

AMERICAN BLOWER

TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

REZNOR'S new SECTIONAL Duct Furnace

- **Capacities to over 2,000,000 BTU**
- **Sectionalized to simplify installation**

Now you can design the *ideal* system for every duct heating situation — and be sure of the equipment to make it work. Reznor's sectionalized assembly (a completely new concept in duct heating equipment) means that installation problems no longer keep you from planning capacities up into the millions.

To provide a system of maximum efficiency at lowest cost, install one of these new furnaces as the heat exchanger with components for air moving, cooling, cleaning and humidification chosen to meet the requirements of the specific application.

New Reznor series DS sectional duct furnaces are assembled on the job out of four basic sections: 150,000 - 200,000 - 250,000 - 300,000 BTU. Capacities range upward in steps of 50,000 BTU from 150,000 to several million BTU. And because the new units are designed to handle large volumes of air with minimum pressure loss, capacities in excess of 2,000,000 BTU are often completely practical.

In addition to the revolutionary DS series, Reznor engineers have also perfected a completely new design for a series of small capacity duct furnaces. Though differing in construction from the DS series, the new series D models offer the same advantages of high efficiency, compact design and light weight. And they have the same adaptability to use in all custom engineered systems for comfort or process heating.

Suggestions on how to take advantage of Reznor's new concept — sectionalized assembly — plus complete details on construction and performance of the new units are included in two new bulletins. Because a Reznor duct furnace may be the key to the solution of any particularly difficult problem, you need to have these bulletins in your files. Use the coupon below to send for your free copies today.

SERIES DS — 150,000 to several million BTU

Each section is complete with controls and built-in draft diverter. Sections can be operated independently to meet less than peak load requirements. Burners are installed in a drawer which slides out the front of the unit to provide easy access for inspection and cleaning. All controls are attached to the burner drawer. Sections may be installed side-by-side in a single bank or back-to-back in a double bank. View above shows the 450,000 BTU model (one 150,000 BTU and one 300,000 BTU section assembled side-by-side).

SERIES D —
50,000 to 125,000 BTU

Reznor series "D" duct furnaces are designed primarily for residential and small commercial applications. Four sizes — 50, 75, 100 and 125,000 BTU. Handsome steel cabinets have burner access and controls completely enclosed on one side.

REZNOR MANUFACTURING COMPANY
66 Union Street, Mercer, Pa.

Please send me my free copies of Bulletins B-55-D and B-55-DS on your new duct furnaces.

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REZNOR
THE WORLD'S LARGEST-SELLING GAS UNIT **HEATERS**

Design fundamentals of the

ALL-AIR HIGH VELOCITY distribution system

By F. J. KURTH | *Vice President of Engineering*

Anemostat Corporation of America

A national survey reveals that today, more than ever, engineers are studying, learning and using high velocity-high temperature differential air distribution. Here is a brief discussion of the advantages of the all-air high velocity system over conventional and mixed cycle (air and water) systems.

1. No Coils — No Clogging — No Odor—There are no coils in the all-air high velocity units. Damp coils collect lint and emit dank odors, and the coils must be cleaned periodically.

2. No Individual Fans — Filters — or Electric Motors — The all-air units operate entirely with air which is processed in the main equipment rooms. The 100% induction units utilize the kinetic energy of the high velocity air to mix primary air with the room air.

3. No Conflict of Trades—The all-air units are installed by the sheet metal trades only.

4. More Effective Use of Outside Air in Spring and Fall—More primary air is delivered to the all-air units than to induction coil units. This allows the engineers to operate in the Spring and Fall on outside air and thereby save refrigeration.

All-air high velocity units offer scientific air diffusion. Each high velocity unit is provided with an aspirating or high induction type air diffuser which is scientifically designed to diffuse air without drafts. Each unit can be pressure balanced by an easy-to-operate balancing device and a calibrated orifice. In fact, the Anemostat all-air high velocity system can be balanced more accurately than other systems and in less than half the time required to balance a low velocity system.

High velocity units require practically no maintenance after installation. They have valves of the non-corrosive, die-cast, "rocket-socket" type, which are patented by the Anemostat Corporation of America. All units can be adapted for the following variations:

1. Single duct for zone control or individual thermostatic or manual remote control.

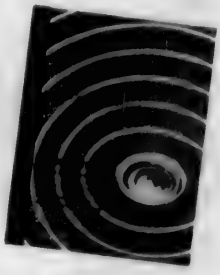
2. Dual duct for thermostatic control or any other type of control.

3. Single or dual duct units with the diffuser fastened to the unit, or remote from the attenuating unit.

4. Under-the-window, sidewall or ceiling type installations.

5. Can be provided with standard aspirating diffusers or 100% induction type diffusers.

6. Induction type units handle temperature differentials up to 33° below ambient.



Selection Manual Contains Data on High Velocity Units

New Selection Manual 50 gives extensive selection and application data on high velocity all-air distribution systems. Write on your business letterhead for Selection Manual 50 to the Anemostat Corporation of America, 10 E. 39 Street, New York 16, New York.

G-E HAS THE ANSWER TO AIR CONDITIONING PROBLEMS IN ANY OFFICE STORE OR FACTORY

Complete air conditioning for Southwest's first skyscraper requires minimum structural changes

Engineers made a complete climate survey of Amicable Life Building (above), then recommended the conversion of an old freight elevator shaft into equipment rooms on 19 floors to house the specified General Electric Packaged Air Conditioners.

SPACE AND MONEY ARE SAVED BY PUTTING G-E PACKAGED AIR CONDITIONERS IN UNUSED ELEVATOR SHAFT

The Amicable Life Building, Waco's familiar 22-story landmark (completed in 1911), was recently air conditioned from top to bottom. The job was completed with practically no inconvenience to the tenants, and at a minimum cost. Expensive structural changes were avoided by converting an old freight elevator shaft into equipment rooms on every floor, and installing a 10-ton and 5-ton General Electric Packaged Unit on each floor. The project moved along at a rapid pace—it took only a few short weeks to complete the installation, and then only 3 days were required to start, check out, balance and put the 36 G-E Units into perfect operation.

CHECK THESE ADVANTAGES OF USING G-E PACKAGED AIR CONDITIONERS

- *Low installation, low operating costs.*
- *Gives the architect maximum design freedom. Units can be used in space or concealed, with or without ducts.*
- *Streamlined cabinet styling. They add to the decor of any interior.*
- *3, 5, 7½, 10, and 15 ton units can be used singly or in multiple to meet air conditioning needs of any building.*
- *Easily directed air flow for no-draft, no-waste air circulation.*
- *Muggy Weather Control removes excess moisture in any weather without over-chilling or clammy cooling.*
- *Built and factory assembled by General Electric. 5-year warranty covers entire sealed cooling system.*

Write for architectural data. General Electric Co., Commercial & Industrial Air Conditioning Dept., Bloomfield, New Jersey.

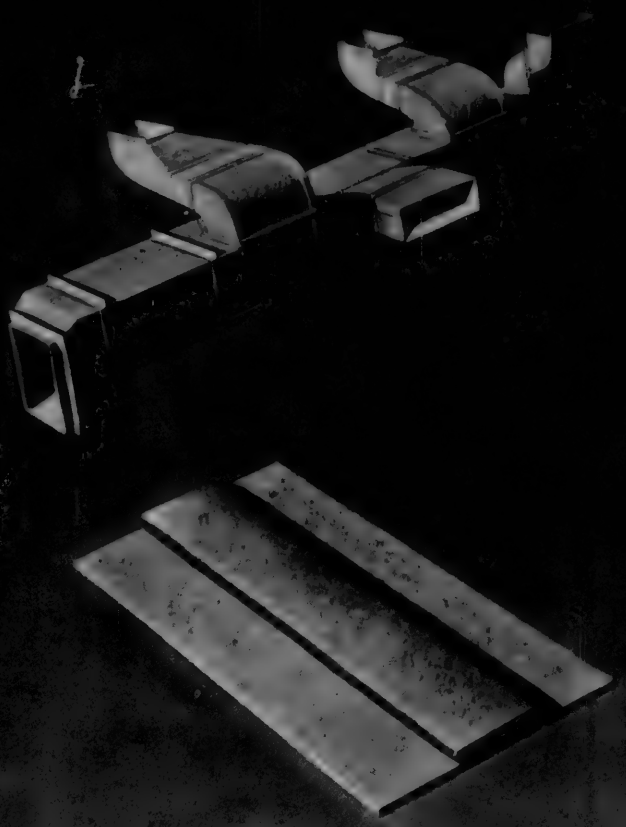
Packaged AIR CONDITIONERS

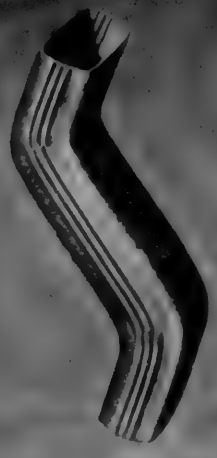
Progress Is Our Most Important Product

GENERAL ELECTRIC

BEST CHOICE

for all your sheet metal work





WEIRTON GALVANIZED STEEL

For gutters, downspouts, air conditioning and furnace ducts, and other applications requiring a durable zinc-coated material, there's no better choice than Weirton galvanized steel—for several reasons.

Weirton galvanized steel has special qualities that stand out over the long run: A tight zinc coating that resists cracking, peeling and flaking . . . better resistance to corrosion . . . exceptional durability—all assured by Weirton's modern plant and processes, and by close control through the entire production cycle.

Next time you place an order for galvanized steel, call Weirton. Chances are we can help to make yours a better product.

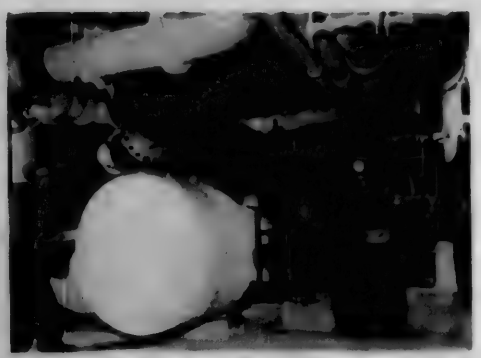
WEIRTON STEEL COMPANY

Weirton, West Virginia

NATIONAL STEEL CORPORATION

WORTHINGTON AIR CONDITIONING SYSTEM in New York's East Side airline terminal . . .

. . . cools 12,000 airline passengers a day



CHILLED WATER to air condition new airline terminal is supplied by this efficient Worthington centrifugal refrigeration unit.

Passengers stay cool and comfortable in New York City's new East Side Airline Terminal while waiting for their trip to the airports.

A joint enterprise serving 21 U. S. and foreign flag airlines, the new terminal accommodates over 12,000 people a day.

And for this modern building, nothing less than a truly modern air conditioning system would do. That's where Worthington came in. A Worthington-engineered, Worthington-built 315-ton centrifugal refrigeration system, along with Worthington air handling equipment and pumps, carries the entire cooling load for the terminal's 3,300,000 cubic feet of space.

Worthington air conditioning equipment has been the choice of leaders in business and industry for over 50 years. For the reasons why, write Worthington Corporation, Air Conditioning and Refrigeration Division, Section A.5.36.–V, Harrison, New Jersey

A.5.36

"SEE the Worthington Corporation Exhibit in New York City. A lively, informative display of product developments for industry, business and the home. Park Avenue and 41st Street."

WORTHINGTON

CLIMATE ENGINEERS TO INDUSTRY, BUSINESS AND THE HOME

JENKINS REGRIND-RENEW
PLUG TYPE VALVES
WITH
500 BRINELL
Armor Seat
Armored against
valve-killing close control
of steam . . . and abrasion
Plug and seat ring are Jenkins JX500, a stainless chromium alloy steel made to Jenkins high strength specifications, heat-treated to 500 Brinell hardness. Seating surfaces are super-hard and mirror-smooth, offer highest resistance to galling, cutting, abrasion, and erosion . . . and "wire drawing" effects of close regulation of steam.
300 lb. 200 lb. 150 lb.
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SOLD THROUGH LEADING DISTRIBUTORS
Call your Jenkins Valve Distributor, and ask for Form 202, or write: Jenkins Bros., 100 Park Avenue, New York 17.
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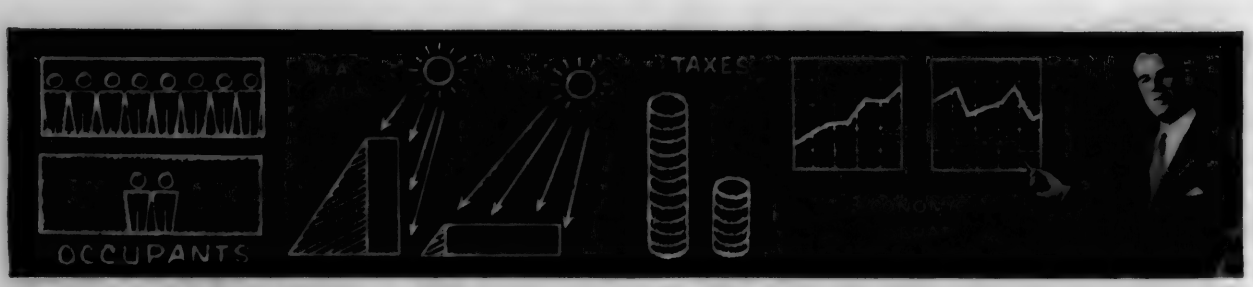
LOOK FOR THE JENKINS DIAMOND



How many factors influence the design of the air conditioning system for a large building? Well, heat loads and glass areas and floor areas and number of occupants, economic considerations and depreciation and taxes are a few. And, since all these factors and a host of others vary from building to building, up and down the land, it stands to reason that no one system (or even two or three) can air condition each building best. That's why York accurately selects and then precision-engineers each Yorkaire System to fit the particular building in which it is installed.

This ability to meet the exacting specifications of nature, the architect and the tax collector—in short, to bring the *right kind* of air conditioning to a building (and to do it all at a reasonable price) compels many of our first-time customers to call York's method a "new concept" of air conditioning. This ability is no happenstance. For not only does York provide a great variety of systems from which to choose, but the men who do that choosing and the precision-engineering that follows—the York Engineers—are highly skilled professionals in the science of air conditioning.

You'll enjoy a "new concept" of air conditioning at the magnificent Fontainebleau!

Magnificent new Fontainebleau Hotel, Miami Beach, where a precision-engineered Yorkaire System brings the right kind of air conditioning to guests while they enjoy modern beachfront luxury at its best. Quality air conditioning at its best is a York specialty, and it can be brought to your building, too. Call your York District Office (listed in the classified phone directory). Or write to York Corporation, York, Pennsylvania.

Seven York V/W Refrigerating Compressors supply cooling for 573 ceiling-mounted air-handling units in this Yorkaire System. General Contractor, Taylor Construction Co.; Architect, Morris Lapidus, New York; Mech. Contractor, Hill-York Corp., Miami.

YORK CORPORATION

the quality name in air conditioning

HEADQUARTERS FOR MECHANICAL COOLING SINCE 1885

Remember—the trade marks "tt" and "TUBE-TURN" are applicable only to products of TUBE TURNS.

You get extra strength with *The Leading Brand*

TUBE-TURN* WELDING TEES are drawn from seamless tubing to a barrel shape. This, and other design features produce high strength—averaging over 25% more than required by applicable standards.

Specify TUBE-TURN Welding Fittings and Flanges for extra values: superior products, the exact fitting or flange you need from our complete line, outstanding engineering service. Call your nearby Tube Turns' Distributor. He is at your service!

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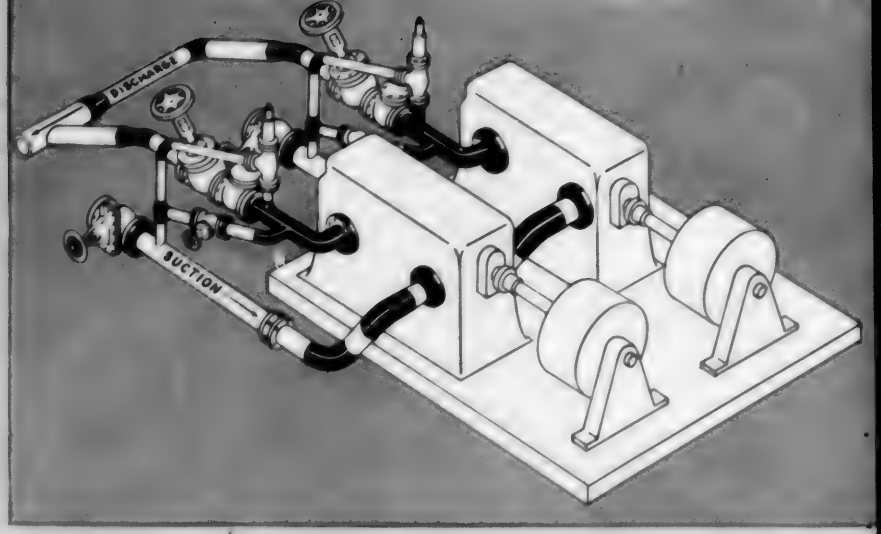
Speed up your piping jobs with TUBE TURNS' SERVICE



ENGINEERING SERVICE—Tube Turns' Engineering Service can help you on your piping projects. For example: Diagram above shows an application where TUBE-TURN® Welding Fittings and Flanges simplified the design and erection of pump piping. They save time, save space, and make the piping permanently leakproof and reliable. Ask your Tube Turns' Distributor to give you the pump piping recommendations of Engineering Service.

COMPLETE LINE SERVICE—You can make sure of getting the right fitting for each job when you specify "TUBE-TURN". This is the world's most complete line of welding fittings and flanges, including more than 4000 items, in all piping materials, schedules, and sizes.

AVAILABILITY—Your nearby Tube Turns' Distributor carries local stocks for fast delivery. Call him for good service in good connections.

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® "U" and "TUBE-TURN" Reg. U.S. Pat. Off.

TUBE TURNS

A DIVISION OF NATIONAL CYLINDER GAS COMPANY

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The UNARCO dual-vector* offers clean, hot water heat in winter ...cool dehumidified air in summer

The UNARCO DUAL-VECTOR is a *quality product newly designed* to make economically feasible the combination of a fine hot water heating system and a chilled water cooling system.

Now you can have all the advantages of hot water heat—cleanliness...smooth, even heat...quiet operation—and in summer, cool, conditioned air. DUAL-VECTORS are used in a series, one-pipe or two-pipe system, providing forced hot water heat *or* chilled water cooling *using the same system.*

What's more, the initial cost is often less than other combination systems which lack the acknowledged advantages of "wet" heat. And because each unit is individually controlled, you can heat or cool as few or as many rooms as desired. Thus the money saved in winter will help pay for your summer cooling comfort. Clip and send in coupon below for detailed information. *trade mark

UNARCO

DUAL-VECTORS are ideal for homes, apartments, hotels, motels, offices and institutional buildings.

HEATING & COOLING PRODUCTS

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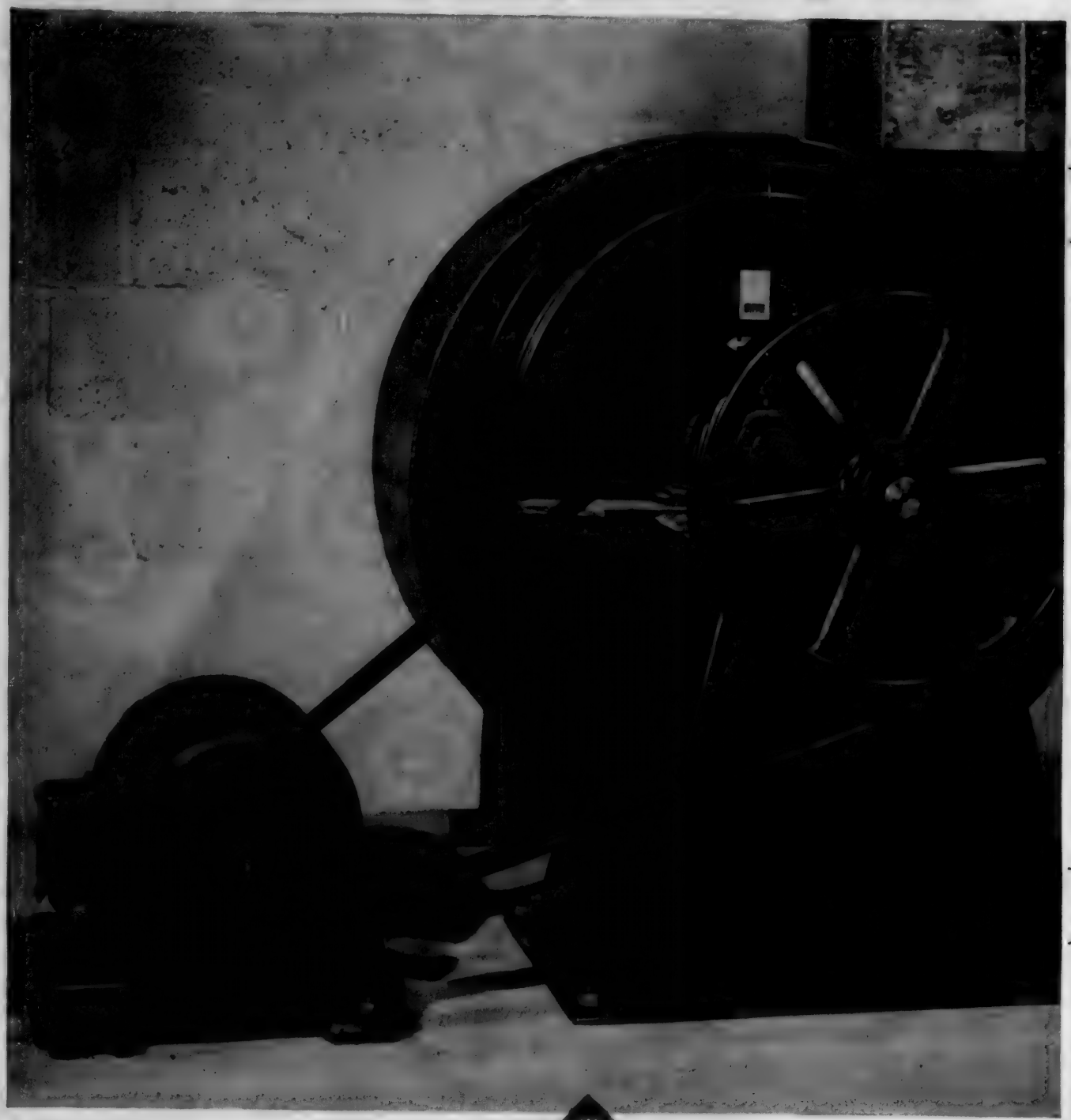

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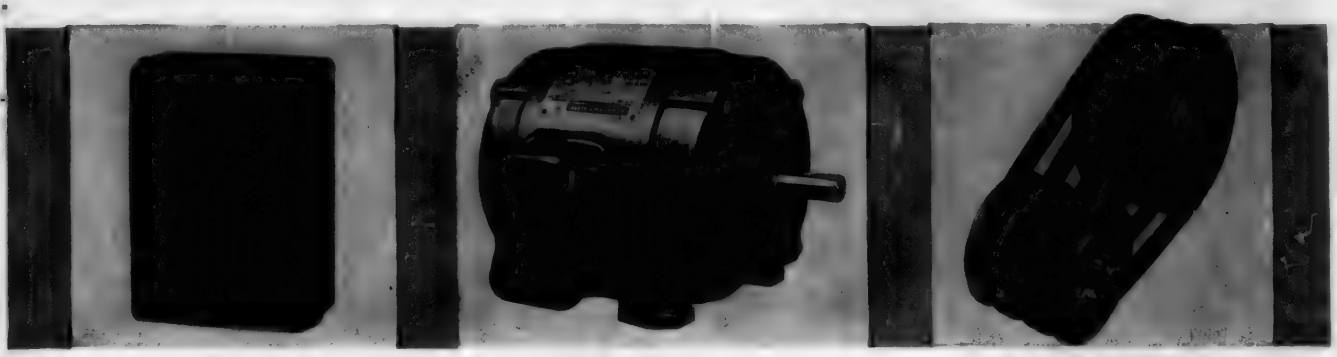
ALLIS-

Installation TIME

with A-C Complete Service— from Power Line to Driven Shaft



CONTROL MOTOR *Texrope* DRIVE

ALLIS-CHALMERS CONTROL-MOTOR-DRIVE COMPONENTS are engineered for you . . . to your specific job! All you have to do is call one of the experienced A-C distributors or representatives near you. He'll save you hours of engineering time! You'll save hours of installation time, too. There's no worry about coordinating three sources of supply . . . there's no worry about whether the components will work together.

With the Allis-Chalmers control-motor-drive combination, one reliable supplier guarantees the complete drive. If you need service, the A-C Certified Service Shop near you will take care of it promptly.

Lower your engineering and installation costs . . . get one source guarantee and reliability . . . see your local Allis-Chalmers representative for an A-C control-motor-drive for your next job.

Ample NATION-WIDE STOCKS

A large stock of control-motor-drive equipment commonly used in air conditioning installations is maintained by Allis-Chalmers district offices and Authorized Distributors. In addition, an efficient warehouse inventory system locates seldom-called-for items within hours after you call. You get immediate action when you specify Allis-Chalmers equipment.

Nation-Wide CERTIFIED SERVICE

North, South, East or West . . . there's an A-C Certified Service Shop near you. A-C Certified Service Shops are independent shops which meet strict Allis-Chalmers standards for modern equipment, efficient methods, and business integrity. These shops assure your customers factory-approved parts, equipment, and fast, efficient service.

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CHALMERS

CHASE® Copper Water Tube for Radiant Heating—*saves you time!*

Because Chase Copper Water Tube comes in long lengths of 60 and 100 feet, fewer joints are needed—a time-saving feature that *also* means a neat, *pressure-tight* radiant heating installation.

And Chase Copper Water Tube is easy to install. It's light in weight, can be easily bent *by hand*, and can be joined quickly with leakproof Chase Copper Solder-Joint Fittings ...using standard soldering techniques.

Furthermore, Chase Copper Water Tube can't clog with rust. Once installed, it's there to *stay*—protecting your reputation with *years* of leakproof service.

Your Chase Wholesaler stocks Chase Copper Water Tube and Solder-Joint Fittings in all sizes. Call him today.

Chase Products mean
a quality job at little
or no extra cost!

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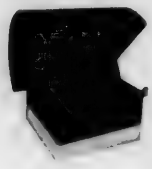
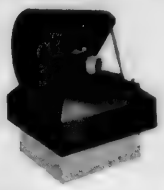
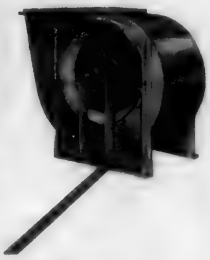
Charlotte†	Denver	Kansas City, Mo.	New Orleans	Rochester†	(Sales office only)



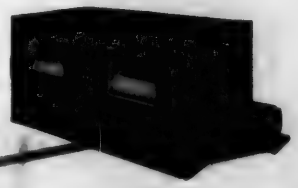


OUR 76TH YEAR



POWER ROOF VENTILATORS, Propeller Fan Type and Power Fixed (backward curve blade) offer a wide range of sizes. Bulletin No. 119 Propeller Fan Type Bull. 124 Power Fixed Fan Type.

BLOWERS, Squirrel Cage (Forward Curve) and Power Fixed (Backward Curve) Fans available in a complete range of sizes, Single or double width. Bulletin 101 (PF) Bulletin 105 (S.C.).

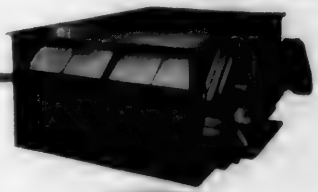


FURNACE FANS, Single, double or special width. All housing and wheel parts are die formed. Available as complete assemblies or parts only. Bulletin No. 115.

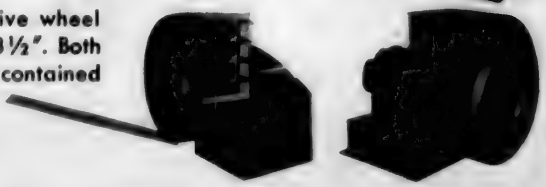
UNIT HEATERS, Blower Type floor or ceiling mounting arrangements, built in sections to facilitate efficient handling and erection. Popular sizes. Bulletin No. 112.

PROPELLER FANS, New Venturi-type Belt drive 24" to 48" wheel diameters, direct drive 12" to 30" diameters. A complete line of accessory items are available. Bulletin 117.

UNIVERSAL BLOWERS, A stock blower assembly made in single or double width, sizes 7" to 27" wheel dia. and features Universal discharge arrangement. Bulletin No. 110.



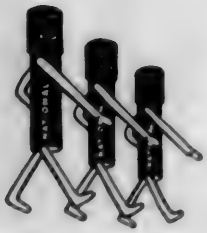
AIR CONDITIONING UNITS, Seven sizes available, ranging from 1,000 to 14,000 C.F.M. Vertical or horizontal mounting. Designed to combine cooling in summer, heating in winter. Bulletin 120.



VENTILATING SETS, Utility type. Belt drive wheel diameters 7" to 30". Direct drive 6" to 13½". Both available in popular competitive sizes, self contained completely packaged units. Bulletin 109.

The BISHOP & BABCOCK Mfg. Co.

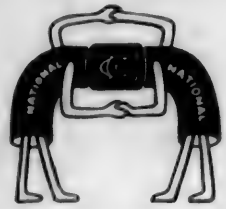
In all types of building and industrial applications...
NATIONAL PIPE IS CHOSEN CONSISTENTLY *because*—



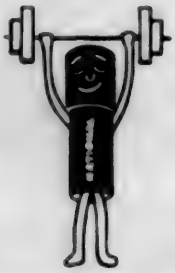
It's uniform throughout—National Pipe is uniform in metallic structure, ductility, strength, corrosion resistance, surface finish and diameter.

It threads and cuts easily—Absence of slag inclusions, laminations and blisters assures smooth, strong threads . . . clean cuts.

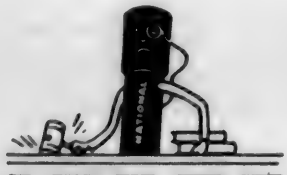
It coils and bends well—National Pipe has that extra strength and ductility so necessary to meet the demands for smooth, uniform coils and bends.



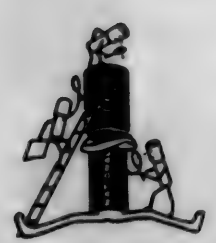
It makes sound joints—Uniformity and accuracy in manufacturing have made unequalled pipe jointing records for National Pipe . . . whether welded or threaded.



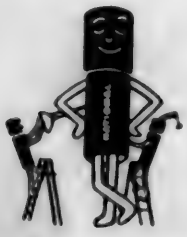
It's strong—Close metallurgical control of chemical and physical properties gives National Steel Pipe "built-in" strength.



It's rigidly controlled—From the raw material to the finished product, one organization has rigid control over the manufacturing steps that produce National Steel Pipe.



It's thoroughly tested—Each and every stage of production is carefully checked by the finest instruments . . . the most experienced men.



It's constantly improved—For over 60 years, National Steel Pipe has constantly been improved to meet the most difficult requirements.

It's gained nationwide acceptance—A cross section of industrial or building applications will show a predominant use of National Pipe . . . largest selling pipe in the world.

USS

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COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS · UNITED STATES STEEL EXPORT COMPANY, NEW YORK

NATIONAL *Steel* PIPE

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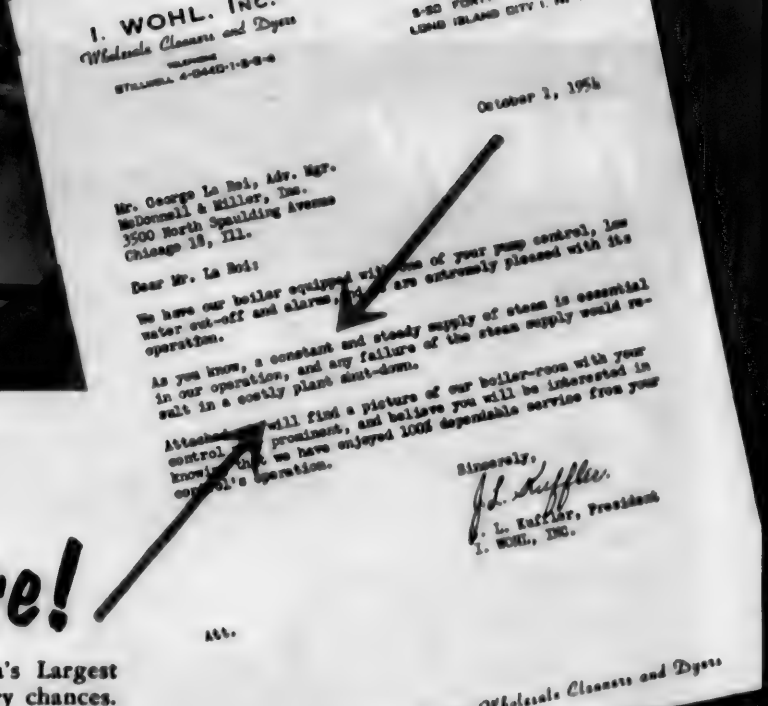
UNITED STATES STEEL


I. WOHL, INC.
Wholesale Cleaners and Dyers

October 3, 1954

Mr. George La Rui, Adv. Mgr.
McDonnell & Miller, Inc.
3500 North Spaulding Avenue
Chicago 18, Ill.

Dear Mr. La Rui:

We have our boiler equipped with one of your pump control, low water cut-off and alarm, and are extremely pleased with its operation.

As you know, a constant and steady supply of steam is essential in our operation, and any failure of the steam supply would result in a costly plant shut-down.

Attached you will find a picture of our boiler-room with your control prominent, and believe you will be interested in knowing that we have enjoyed 100% dependable service from your equipment's operation.

Sincerely,
J. L. Kuffler
J. L. Kuffler, President
I. WOHL, INC.

Att.

One of America's Largest Wholesale Cleaners and Dyers

No paralyzing shut-downs here!

I. Wohl, Inc. didn't grow to be "One of America's Largest Wholesale Cleaners and Dyers" by taking unnecessary chances. Their letter to us tells the story. The Wohl management knows that an unfailing steam supply is the first essential of keeping operations under way.

You know it too . . . but what you may not realize is how unexpectedly a boiler shut down can occur when the water level is not controlled by modern equipment. Thousands of plants, like I. Wohl, Inc., have found McDonnell Boiler Water Level Control the most economical and dependable way to keep the boiler going. Read the facts; then ask for simple installation instructions that will show you how easy it is to end the shut-down shudders.

McDONNELL & MILLER, INC., 3500 N. SPAULDING AVE., CHICAGO 18, ILL.

Doing One Thing Well

What could be simpler?

The accompanying diagram shows the simple hook-up of the widely used McDonnell No. 150 Pump Control and No. 27 Make-up Water Feeder for boilers like yours (up to 150 psi.). The No. 150 starts and stops the pump as the water rises and falls, to hold the level within close limits. The No. 27 is installed on the receiver to supply make-up water—assure an ample level of water in the receiver at all times. A second switch is provided on the No. 150 for cutting off burner and sounding low water alarm in the event of an emergency such as current interruption in the pump circuit or failure of water supply.

By holding the water level within close limits, the McDonnell hook-up achieves steaming efficiency and fuel economy that would make it a profitable investment even if there never were a threat of low water!

—or more dependable?

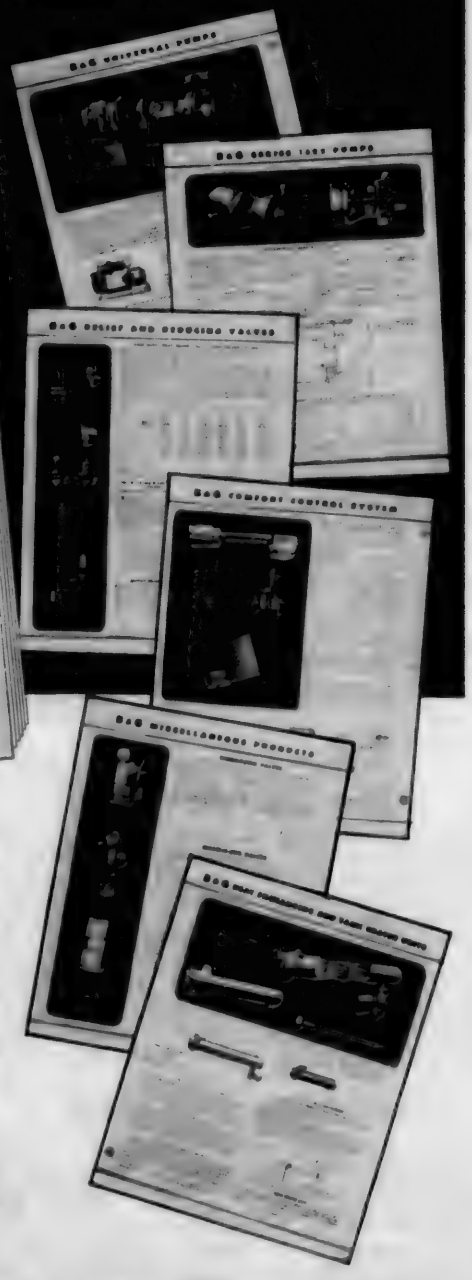
Ability to stand up under the pressure and temperature of laundry and cleaning plant operation is attested by the success of hundreds of McDonnell installations. The No. 150 is approved by Underwriters' Laboratories, Inc. Switch leads have heat-impervious, porcelain-bead insulation. Packless construction is provided by extra-heavy monel bellows. Float has extra-heavy shell. Entire mechanism is sealed to prevent tampering.

The No. 27 is equally rugged and dependable. It has large water feeding capacity; bronze and stainless steel valve mechanism. Every detail of construction speaks quality. Other make-up feeders are available to meet almost all conditions.

McDONNELL *Boiler Water Level Controls*

NEW CATALOG

Presenting the last word in equipment for forced hot water and service water heating systems. Send for your copy of this 28-page Catalog.



In this comprehensive catalog, Bell & Gossett Company brings you all the latest information on B & G *Hydro-Flo* Heating Products. You'll find a complete line of equipment, including new and improved items for better heating.

You benefit in two ways when you concentrate your purchases on B & G *Hydro-Flo* Products. First, by a line of equipment recognized everywhere for superiority of design, materials and workmanship. Second, by utilizing a single source of supply which gives you a completely integrated installation with one manufacturer's guarantee.

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Dept. DT-4, Morton Grove, Illinois
Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto, Ca

SelecTemp room units, only 18 inches high, are recessed into wall and can be painted to match color scheme. Three sizes: 6,000, 12,000, and 18,000 Btu output. 12,000 Btu size shown below. No electric wiring or power is used. Small flexible copper tubes carry steam to each room unit.

Why Iron Fireman® SelecTemp® is the greatest advance in modern heating

This Quick Quiz Tells Story

Features never before available bring new heating standards to apartments, hospitals, motels, office buildings, schools and other buildings of every size and type.

Q. What features are new and better in Iron Fireman SelecTemp heating?

A. (1) Thermostat in every room; (2) modulated (not "on-off") heat; (3) filtered warm air continuously circulated; (4) easily installed in new or old construction; (5) boiler can be located anywhere; (6) moderate operating costs.

Q. How does SelecTemp provide individual room temperature control?

A. Each room heating unit has its own thermostat. Temperature in any room, including bathrooms, can be raised or lowered without affecting temperature in any other rooms.

Q. What is meant by "modulating" heat?

A. SelecTemp is not "on-and-off" heating. Each room unit automatically modulates its own heat output. Steam turbine operated fan in each unit runs faster or slower, according to amount of heat needed, gently circulating filtered warm air.

Q. What happens when south rooms face warm sunshine and north rooms face cold winds?

A. SelecTemp heaters in the rooms affected act at once, adjusting heat output to the needs of the individual rooms. Heating units on the warm side of the building slow down to compensate for solar heat, while those on the cold side increase heat delivery to make up for extra heat loss. SelecTemp units mounted in outside walls quickly sense temperature changes and automatically increase room temperature to keep comfort level constant. Reaction is fast and accurate—no outside thermostats required.

Q. Is SelecTemp reasonable in cost?

A. Yes. The system is engineered for very economical installation and operation, both in new construction and modernization. SelecTemp, a new, different and revolutionary kind of heating, is one of the most desirable features you can put into any type of building where human comfort is involved.

SEND FOR FREE SELECTEMP BOOKLET . . .
Contains complete description, with specifications for builders and architects. Use coupon below.

Iron Fireman®
SelecTemp®
MODULATING ZONE HEATING

Iron Fireman Manufacturing Company
3064 W. 106th St., Cleveland 11, Ohio.
In Canada: 80 Ward St., Toronto, Ontario.
Please send free descriptive booklet on SelecTemp heating.

Name _____
Address _____
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Remotaire Model TRA
for 100% Air Recirculation

New Remotaire Room Conditioner by American-Standard

. . . specially adaptable to interior ventilation systems

● Now American-Standard Remotaire is more versatile than ever. A new unit—the Model TRA—is designed for cooling and heating the peripheral zone of office buildings, hotels, and other buildings which use interior ventilation systems. Fresh outside air is supplied by small ducts connected to the air conditioning system of the interior zone. These ducts usually are located in furred down ceilings and are connected to small side wall outlets or ceiling diffusers. The interior zone system is designed to provide a mixture of conditioned outside air and recirculated air, or for 100% outside air during intermediate seasons.

Designed for total recessing, the new Model TRA uses a simple piping system that carries hot water for winter heating and chilled water for summer cooling from a central plant. Room air is conditioned all year long!

Available in 200, 300, 400 and 600 cfm sizes, the Model TRA unit has three-speed fan control which provides a wide range of air quantities and heating and cooling capacities. A size for every job!

Look what Remotaire offers:

Every Remotaire unit is listed by Underwriters' Laboratory, Inc., Re-examination Service.

One simple piping system for both summer cooling and winter heating.

Individual room temperature control without affecting adjoining space.

Large filters which keep air fresh and clean.

Drain pan runs the entire length of unit to collect condensation drip.

Coil shield prevents foreign matter from falling into coil.

American-Standard Water Chillers for use with Remotaire Systems are available in sizes from 2 to 75 hp. And for the heating cycle, American-Standard has a complete line of boilers for all heating requirements. One dependable source for a *complete* heating-cooling system.

AMERICAN-Standard
WATER HEATING-COOLING SYSTEMS

American Radiator & Standard Sanitary Corporation, P. O. Box 1226, Pittsburgh 30, Pa.

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • TONKLAD AIR CONDITIONERS

keeping steam cheap...

Light industrial heating

Hospital Heating and Services

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Heating for Buildings

B&W TYPE FM UNIT

Provides Big Boiler Performance in a "Package"

Since the first FM Boiler was placed in service a few years ago to produce steam for a combination processing and heating operation, almost 2,000,000 lb per hr of steam capacity have been installed or ordered for heating alone. An additional amount of heating—part of the combination services used by everything from bakeries to steel plants, is indeterminable.

In any service, whether building heating or industrial, the FM Boiler should serve indefinitely. A central-station type boiler in every respect except size, it is built to last, virtually without maintenance. An "economy size" package, the FM packs a large, dependable steam capacity in a small space.

Ideal for small to medium-sized installations, the FM Boiler is available in individual units in capacities to 36,000 lb of steam per hr and can also be applied to high-temperature water-heating service. Fully automatic operation—faster and more accurate than manual—provides easier, more efficient response and control of combustion over the load range, for fuel savings and smoke control well within local regulations.

Easy to install, attractive, and clean, this compact B&W steam generator fits into any type of building; is at home doing its job no matter where installed. The FM is delivered complete, ready to hook-up and place in operation.

Reflecting wide acceptance with users in almost every category in addition to heating, the B&W Type FM Boiler is now in service or on order for a total steam capacity of well over 9,000,000 lb per hr. Bulletin G-76A will give you details. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, N. Y.

COST-SAVING FEATURES

- Saves Erection Time and Cost
- Meets Wide Range of Service
- Handles Quick Load Changes
- Fast Steaming
- Low Maintenance
- Easy Accessibility
- Suitable for Outdoor Service
- Burns Oil and/or Gas
- Saves Fuel
- Saves Space
- Safe, Automatic Operation

BABCOCK & WILCOX

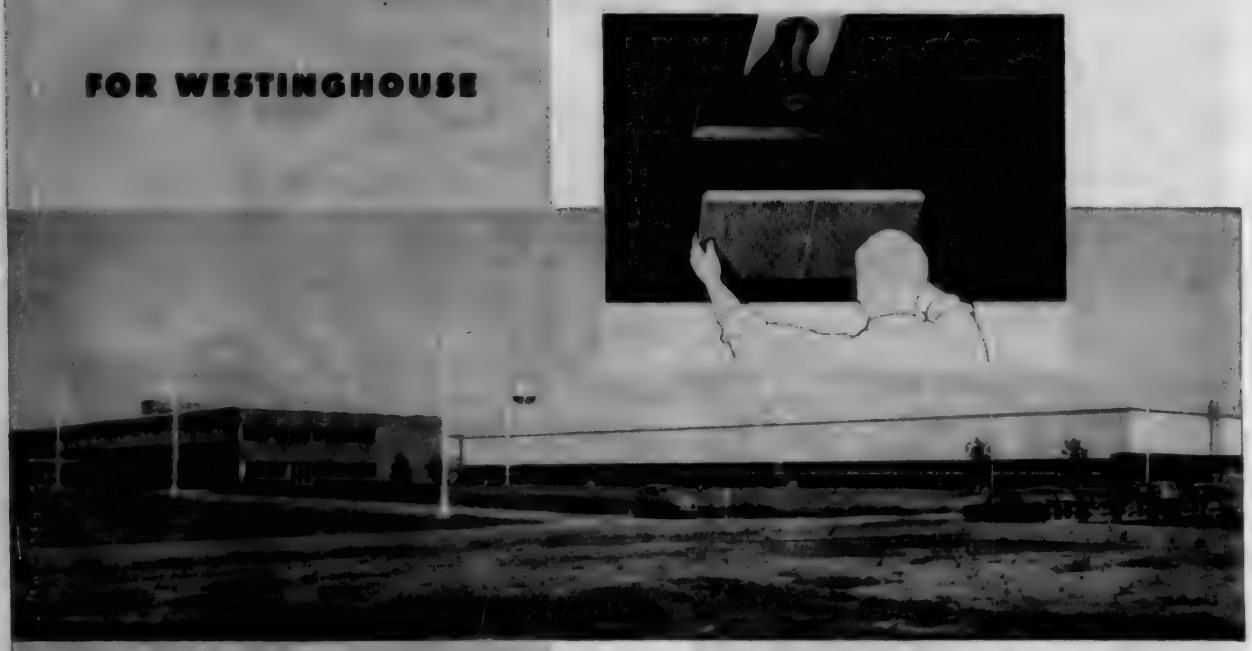
BOILER DIVISION

G-483

IDEAL "INDOOR WEATHER" WITH... multi-vent

LOW VELOCITY AIR DIFFUSERS

FOR WESTINGHOUSE



Westinghouse Meter Division Plant, Raleigh, N. C. Robert and Company Associates, Atlanta, architects and engineers. Virginia Engineering Company, Inc., Newport News, General Contractors.

Partial list of prominent companies which have recently installed Multi-Vent in offices, plants and laboratories.

Boeing Airplane Co.
Cincinnati Gas & Power
Dow Chemical Co.
I. E. DuPont DeNemours & Co.
Ford Motor Co.
General Telephone Co.
H. J. Heinz Co.
International Harvester
Eli Lilly & Co.
Mead Johnson & Co.
Ohio Oil Co.
Pittsburgh Plate Glass
Rand McNally & Co.
Sawyer Biscuit Co.
G. D. Searle Co.
Sharp and Dohme
Southern California Gas
Standard Oil of Indiana
U. S. Steel Corp.
Yale & Towne

FOR GENERAL OFFICES—LABORATORIES ENGINEERING DEPARTMENTS—TEST ROOMS

As in the Westinghouse plant, illustrated above, and in other industrial plants, Multi-Vent is specified where true air conditioned comfort or accurate control of air movement, temperature and humidity is demanded.

Because Multi-Vent is designed and engineered for easy installation and to handle high loads and high ventilating requirements, with a uniform low rate of room-air motion, it meets the most exacting demands of industrial processing and scientific research.

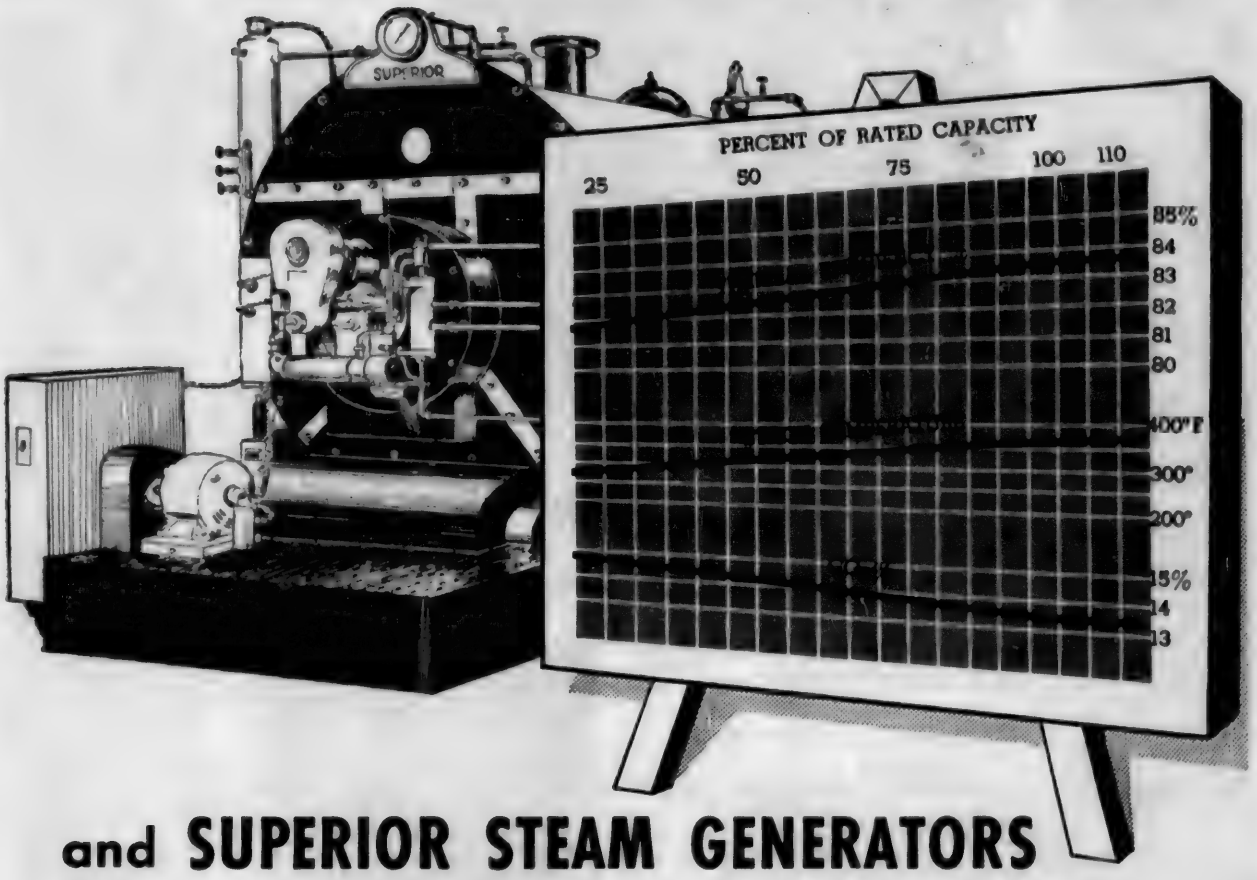
Flush or completely concealed in the ceiling, Multi-Vent distributes air at low-velocities by gentle pressure displacement, thus providing a degree of air conditioned comfort unmatched by any other diffuser. Write for detailed literature.

THE PYLE-NATIONAL COMPANY
1374 North Kostner Avenue, Chicago 51, Illinois

MULTI-VENT DIVISION
Sales and Engineering Representatives in Principal Cities of United States and Canada

PERFORMANCE

is part of the PACKAGE



and SUPERIOR STEAM GENERATORS are rated for actual operating conditions

Superior Steam Generators are fully automatic, burning oil or gas or both. 18 sizes from 20 to 600 b.h.p. for pressures to 250 p.s.i. or for hot water. Write for catalog 719.

The payoff in performance is in your plant—here is where a steam generator must live up to the claims of its maker or you are the loser. Every Superior Steam Generator is "Performance Rated" on the basis of tests conducted under conditions duplicating those of actual service and is guaranteed on the results of these tests. The chart above shows typical performance of a Superior Steam Generator at 100 lbs. pressure. It is based on tests conducted by professors from Lehigh University on a boiler which had been in actual service for over a year. You can depend on results like these throughout a longer serviceable life when you specify Superior Steam Generators.

for performance you can **BANK** *on*

SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.

SUPERIOR STEAM GENERATORS

WING PACKAGE DRAFT INDUCER

FOR POWER PLANTS

MOTOR AND FAN DESIGNED AS ONE COMPLETE REMOVABLE UNIT

MAKES INSTALLATION EASIER

FACILITATES INSPECTION AND MAINTENANCE

SAVES SPACE

ELIMINATES WATER COOLING OF BEARINGS

INTERCHANGEABLE INLETS—TOP, BOTTOM OR SIDES

NO LUBRICATION REQUIRED—BEARINGS PRE-SEALED

WING PACKAGE DRAFT INDUCER AT PLANT OF WELCH GRAPE JUICE CO.

Write for complete details

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158 Vreeland Mills Road
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Factories: Linden, N. J. and Montreal, Canada

Wing

CLEAVER-BROOKS SELF-CONTAINED BOILERS HAVE THE FEATURES EVERYONE WANTS!

...which feature would be most important to you?

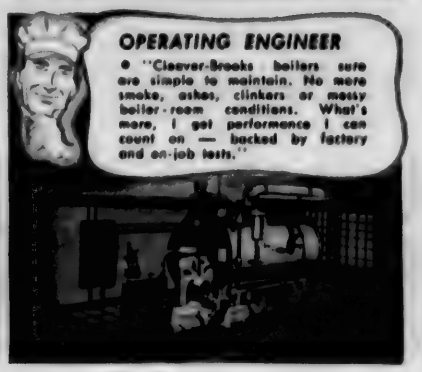
PLANT OWNER
• "Cleaver-Brooks boilers are tops in fuel economy! Forced-draft, four-pass construction and 5 sq. ft. of heating surface per boiler H.P. assure me 80% operating efficiency when firing with oil."

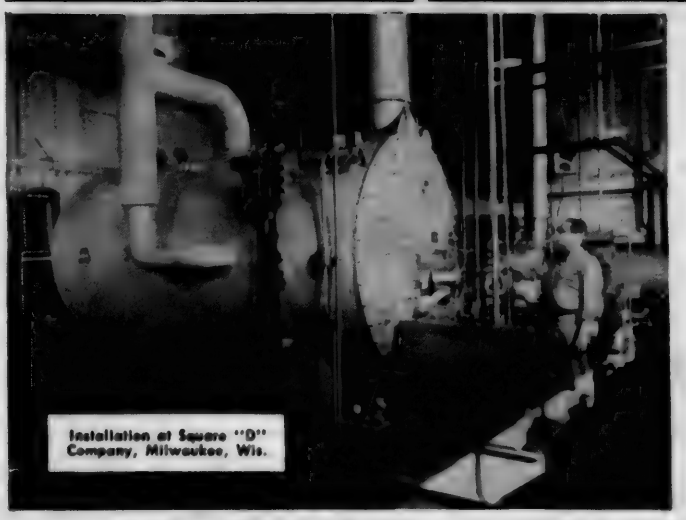
ARCHITECT
• "Self-contained design certainly simplifies boiler room planning — gives owners maximum use from each square foot of space. Gives me flexibility to make best use of low head room conditions."

CONSULTING ENGINEER
• "Oil, gas and combination oil/gas firing lets me recommend Cleaver-Brooks boilers for installation anywhere. Exclusive burner design makes it possible to interchange gas/oil firing in 10 seconds.

CONTRACTOR
• "Boilers are shipped ready to install. With service lines in, my crews have boilers ready for operation in 24 hours or less after delivery. No foundation or stack problems. Cleaver-Brooks furnishes starting service, too."

PLANT SUPERINTENDENT
• "I get all the steam I need for fluctuating steam demands, from full load down to 30% of rating. Automatic burner controls assure instant firing. I call that real dependability."


OPERATING ENGINEER
• "Cleaver-Brooks boilers sure are simple to maintain. No more smoke, ashes, clinkers or messy boiler-room conditions. What's more, I get performance I can count on — backed by factory and on-job tests."



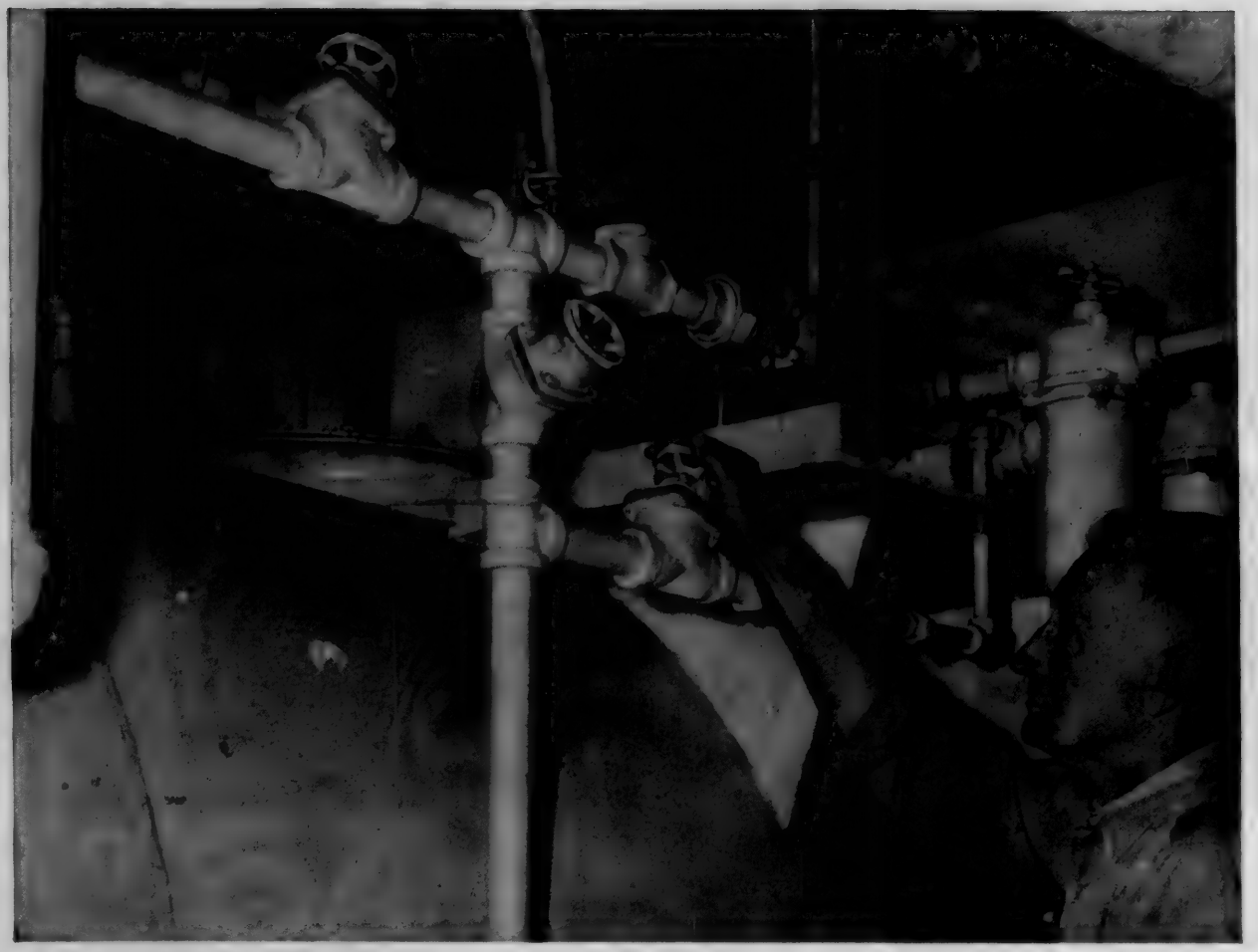
THESE are just a few of the many outstanding features that have made more than 15,000 individual Cleaver-Brooks self-contained boilers *first choice* for commercial, institutional and industrial applications. Get in touch with your nearest Cleaver-Brooks representative for complete facts, or write for catalog AD-100. Cleaver-Brooks Co., Dept. B, 315 E. Keefe Ave., Milwaukee 12, Wis., U.S.A. — *Cable address: CLEBRO — Milwaukee — all codes.*

Cleaver Brooks

"It's NEW — get the facts on the CB boiler — write today!"

BOILERS — STEAM OR HOT WATER — FOR HEATING OR PROCESSING IN SIZES FROM 15 TO 500 HP, 15 TO 250 PSI.

NOW — FIRST SIZES OF THE CB BOILER ARE MADE IN CANADA, TOO.



Light oil meets its master in these CRANE VALVES

THE CASE HISTORY— Read how the Johnson & Johnson baby products plant at Cranford, N.J., completely stopped a valve leakage condition that wasted product . . . caused a safety hazard . . . and menaced the plant's high sanitation standards.

Valves formerly used on very light baby oil lines were the source of trouble. Keeping them tight at the stuffing box was next to impossible. Constant servicing of stuffing boxes was necessary, even after repacking every 4 to 8 weeks. Several packings were tried without success while the high maintenance costs and nuisance conditions continued.

Early in 1951 the plant found the solution in Crane No. 1610 Packless Diaphragm Valves. They removed the cause of leakage —immediately stopped its troubles and costs. Almost 4 years later—with no maintenance whatsoever—the Crane packless valves remain absolutely tight; continue giving perfect service. And that goes for all valves added since the first installation.

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When you have valve problems with hard-to-hold fluids, try Crane *Packless* diaphragm valves. They eliminate stem leakage and maintenance on air, vacuum, gas, light oil and similar services. Their diaphragm has longer life, yet should it fail, their separate disc prevents escape of line fluid. Available in wide selection of materials and sizes. Ask for folder AD-1942 or see your Crane Representative.

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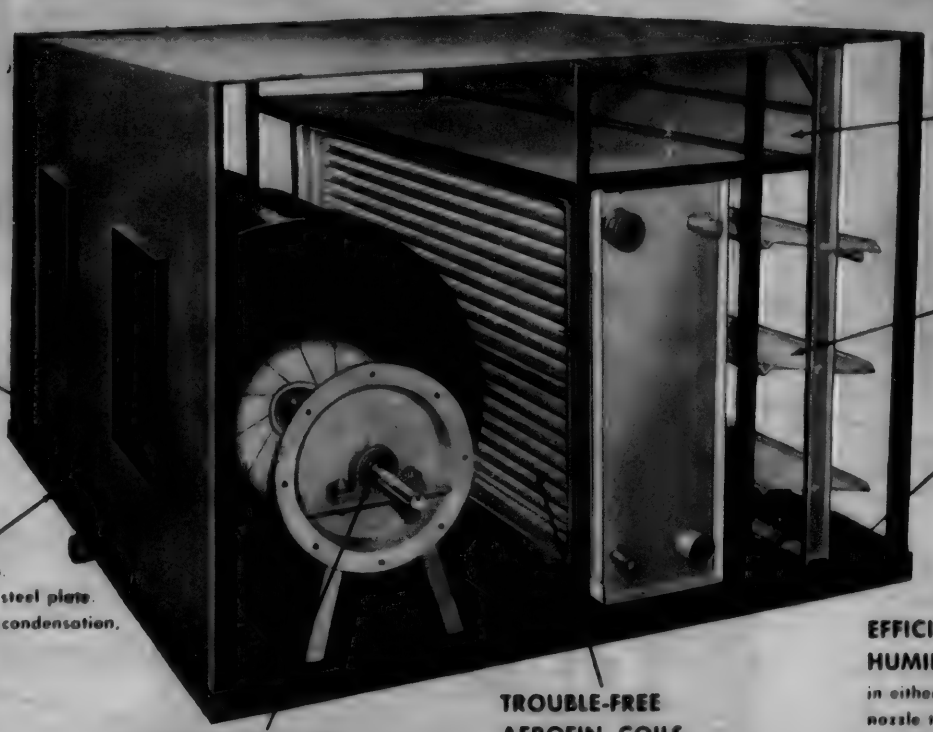

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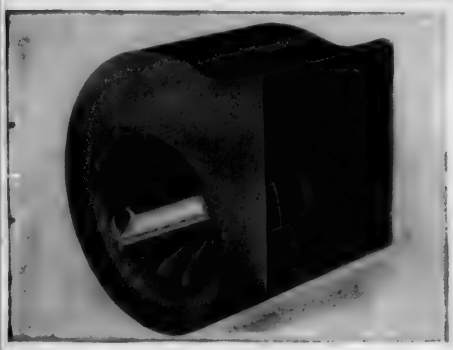

STABLE, EFFICIENT, QUIET DELIVERY, with "Buffalo" mixed-flow fans — much more efficient than forward curve wheels and can be operated at higher pressures and speeds at lower noise level.

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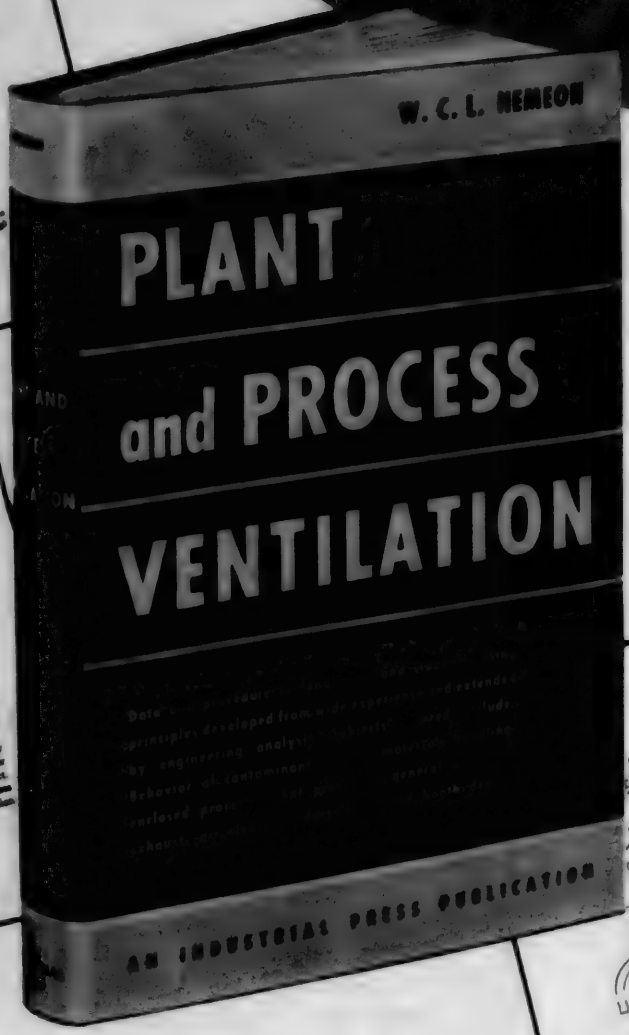

CONTENTS

Objectives and General Considerations

Dynamic Properties of Airborne Contaminants

Airborne Dispersion

General Principles of Local Exhaust

Local Exhaust and Exterior Hoods

Control Velocities and X-Distance for Exterior Hoods

Air Flow Caused by Fragments

Canopy Hoods—Exhaust for Hot Processes

Characteristics of Free Air Jets

General Ventilation

Design of Duct System

Exhaust Systems for Dust

Evaluation and Control of Heat Exposures

Field Observations and Assembly of Design Data

Methods of Moving Air

Exhaust Air Cleaning

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PLANT and PROCESS VENTILATION, by W. C. L. Hemeon, contains new, original conceptions of ventilation principles and practice that will enable you to analyze and solve all types of industrial ventilation problems. The author is Engineering Director of the Industrial Hygiene Foundation, and is thus eminently qualified to present this subject in a clear and comprehensive manner. His book differs from others on ventilation in that emphasis is placed on the estimating of ventilation quantities required in various industrial applications, while the subject of duct design, a well understood technique, has been simplified by condensation of design data.

PLANT and PROCESS VENTILATION provides you with design factors and data that can be applied to any situation. Principles are clearly set forth and lead logically to rules of procedure. Those principles which apply to exterior hoods and booths are extended to cover all ventilation and material transport situations. By the simple observation of a process, you can now estimate accurately the exhaust requirements of any cold, multi-directional process; and, with the necessary field data, refer to tables which summarize exhaust requirements for such a situation.

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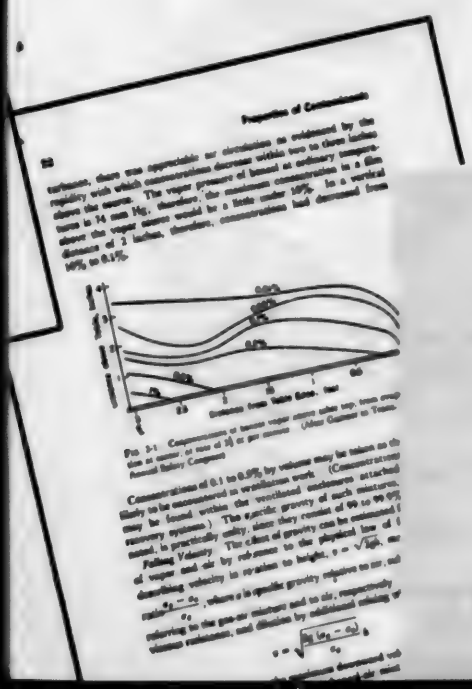

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Air Distribution

Puts shoppers in buying mood at Burdine's . . .

It isn't often that a mechanical engineer says "The equipment has usually exceeded the performance of published data." Yet that's the comment made after Uni-Flo equipment was installed throughout the beautiful new home of famed Burdine's in Miami Beach, Florida. Not only was performance above par, but, as can be seen below, the Venturi-Flo Diffusers are small and inconspicuous in appearance, harmonize with the decorated ceilings, are easy to adjust. Experience indicates, too, that Venturi-Flo Diffusers keep ceiling smudge at a minimum.

Architects: WEED, RUSSELL, JOHNSON, AND ASSOCIATES. *Interior Designer:* RAYMOND LOEWY. *Structural Engineers:* NORMAN J. DIGNUM AND ASSOCIATES. *Mechanical Engineer:* R. L. DUFFER. *Air Conditioning Contractor:* HILL-YORK SALES CORP.

New, two-story building (83,400 square feet) covers approximately a city block, provides an ultra-modern, luxurious setting for Burdine's "Sunshine Fashions."

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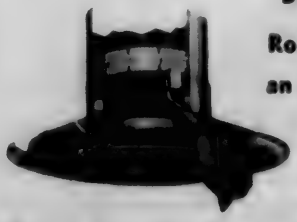
BLAZING THE TRAIL TO BETTER AIR DISTRIBUTION



Round Ceiling Diffusers . . . an early pioneering success

Barber-Colman Company's entrance into the air distribution field twenty years ago started an increasing flow of pioneering developments. From the largest and best equipped laboratory in the industry came the Venturi-Flo Ceiling Diffusers, first of a series of ceiling diffusers designed for balanced air distribution in modern buildings. In these units, air patterns are adjustable after installation from vertical to horizontal discharge. A wide range of styles and sizes is available for recessed or surface mounting, with or without integral lights. Accessories include volume control, air flow balancing and air turning devices. For latest literature and expert engineering advice, consult your nearby Field Office or write us.

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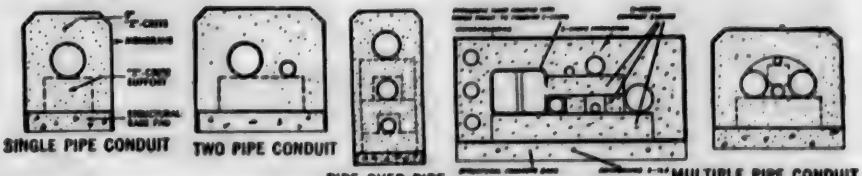

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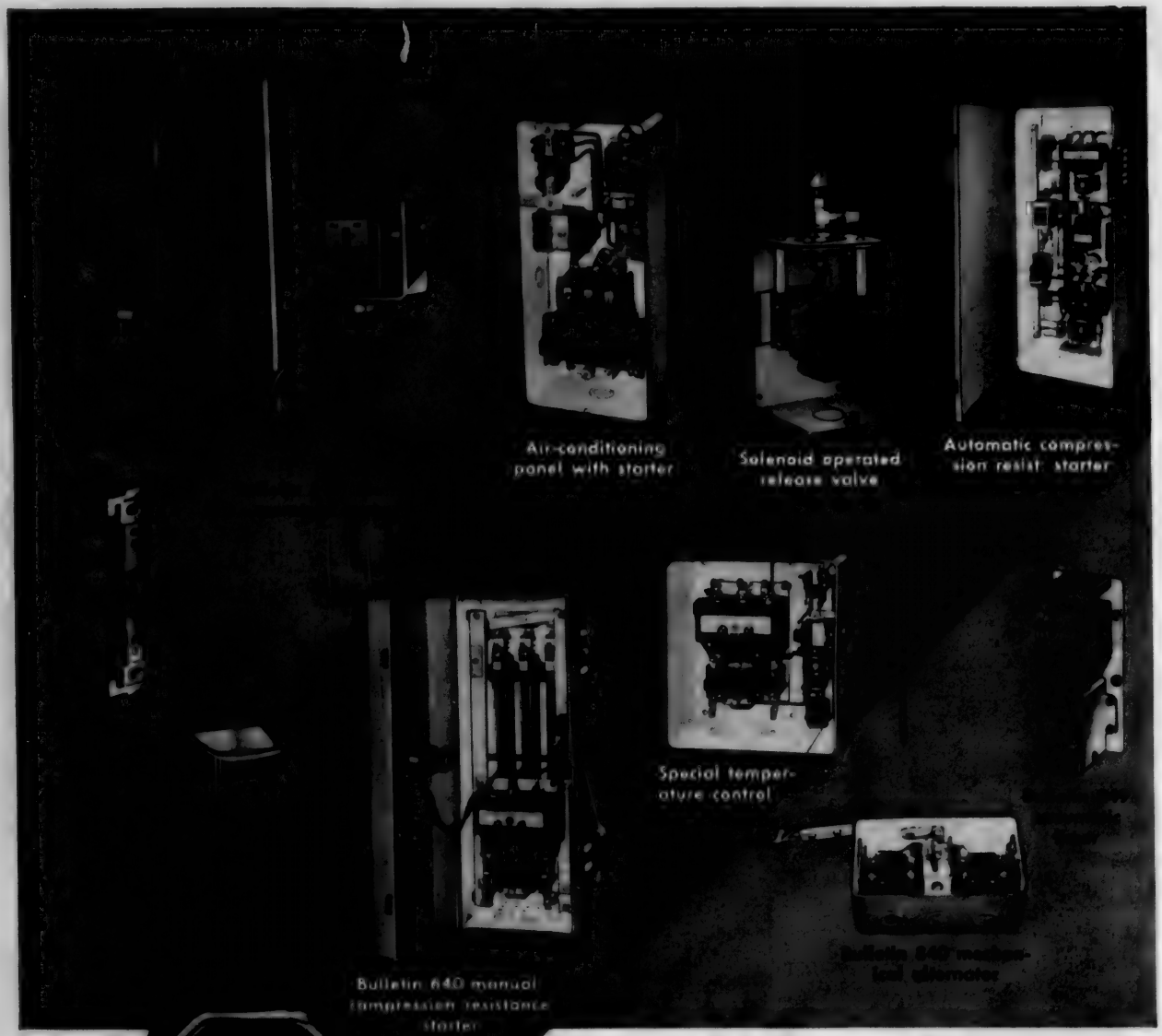
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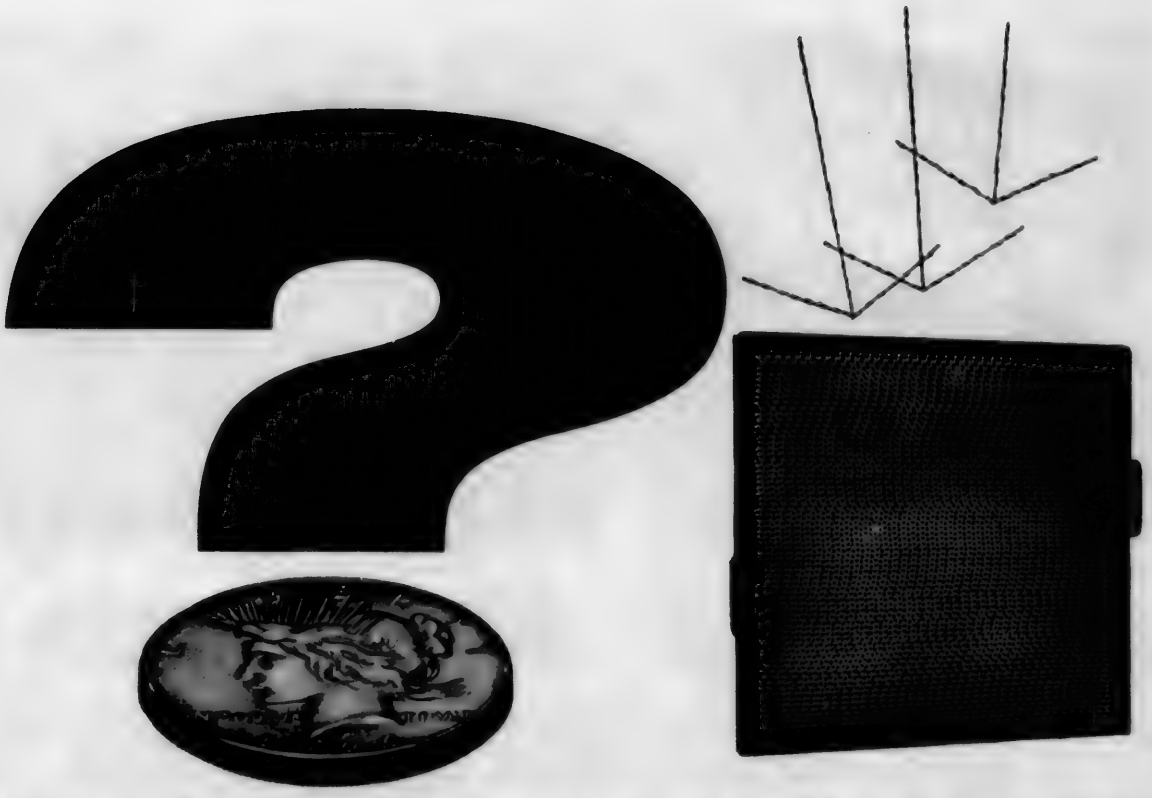

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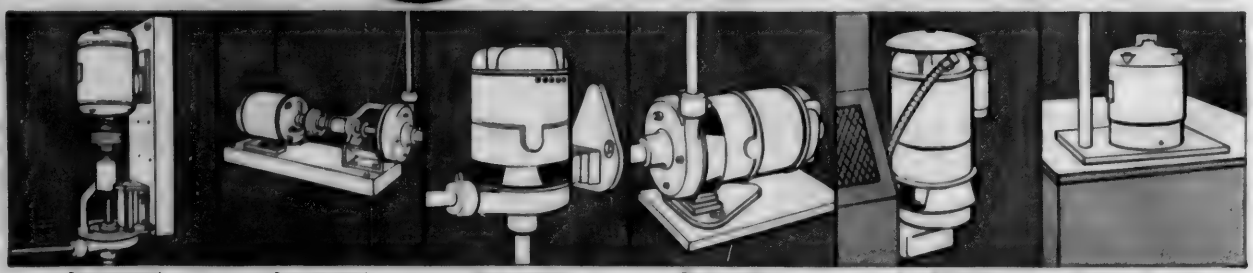

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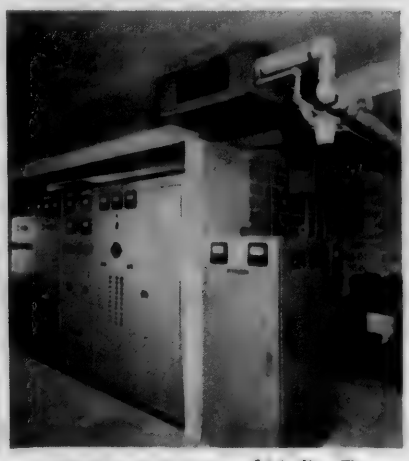

CEILING INSTALLATION of Modine Type BT Cabinet Units delivers large volumes of heated air . . . quietly and gently. Temperature is controlled automatically.

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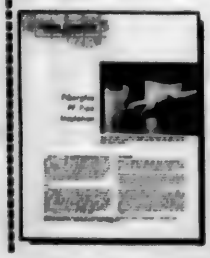

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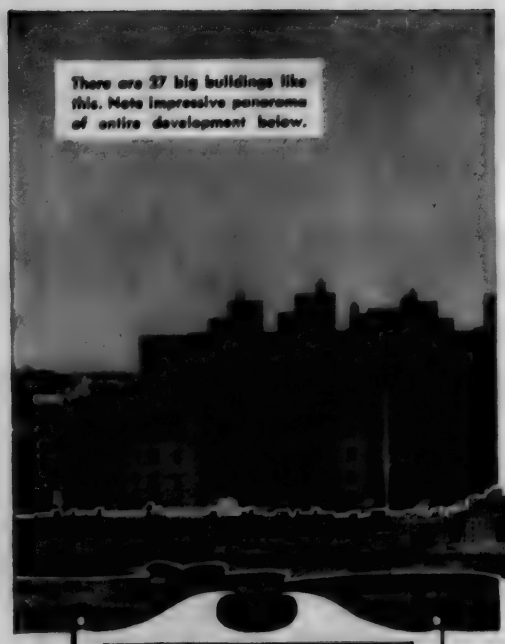

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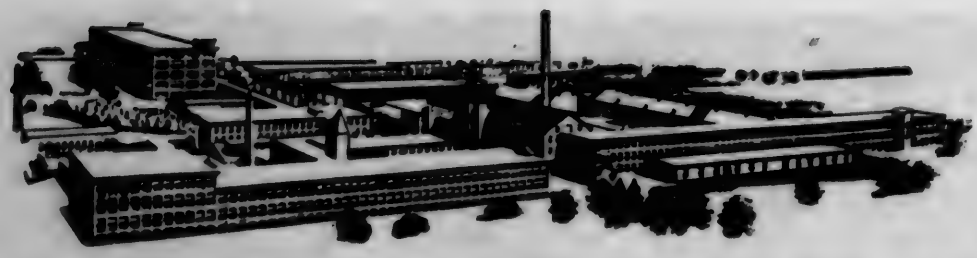

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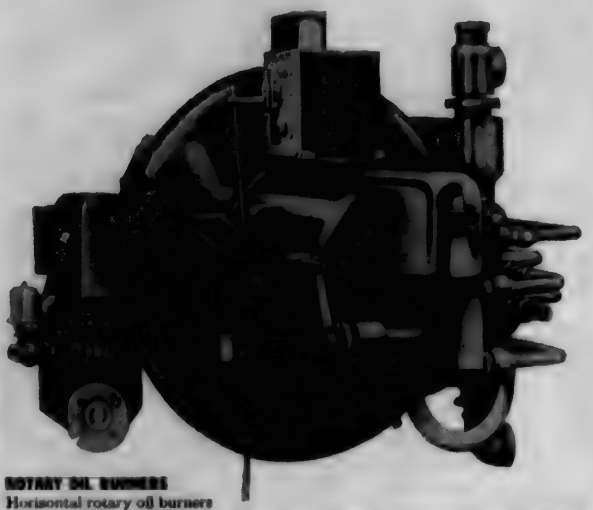

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PETRO oil burners do *two* jobs in this huge plant. They produce steam for heat and generate the electric power for plant operation. "We consider it nothing short of a minor miracle the way your dealer's engineering department came in here and changed us over to oil in the middle of winter without causing us to curtail the least bit in either power or heat," says Mr. Rockwell. Petro oil burners can save money for you too.

PETRO preheats oil for steady, sure firing

Cold oil is sluggish, starts slowly, and burns irregularly so the makers of Petro adopted the "thermal viscosity principle" of *preheating oil* to an efficient temperature before it is injected into the firebox. This makes possible fast starting, steady firing, and lower fuel costs.

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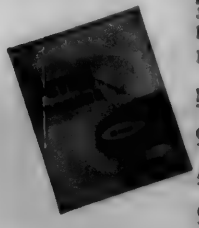

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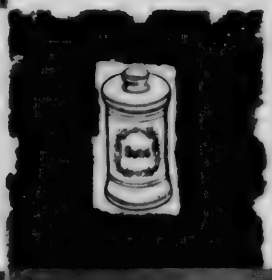

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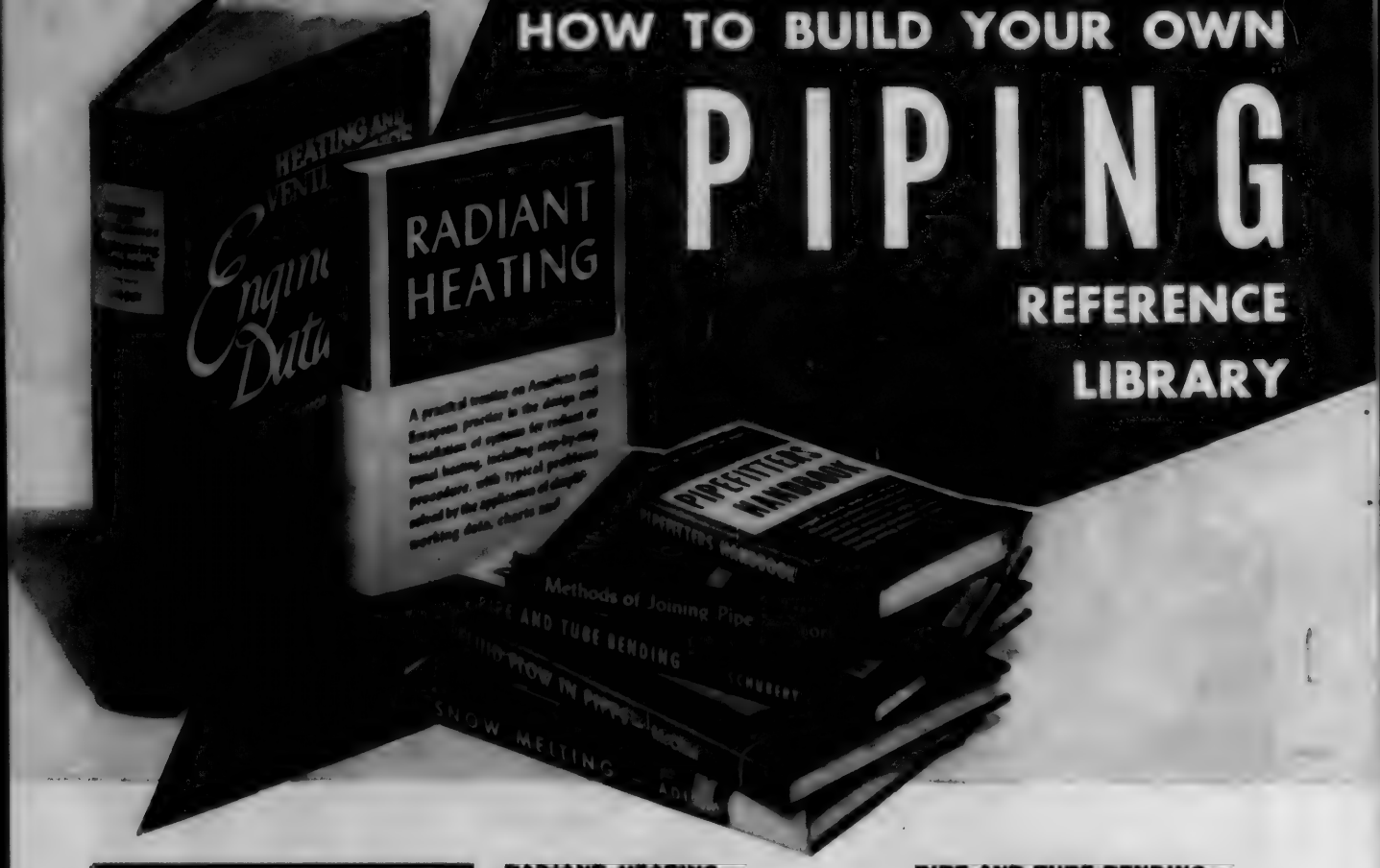

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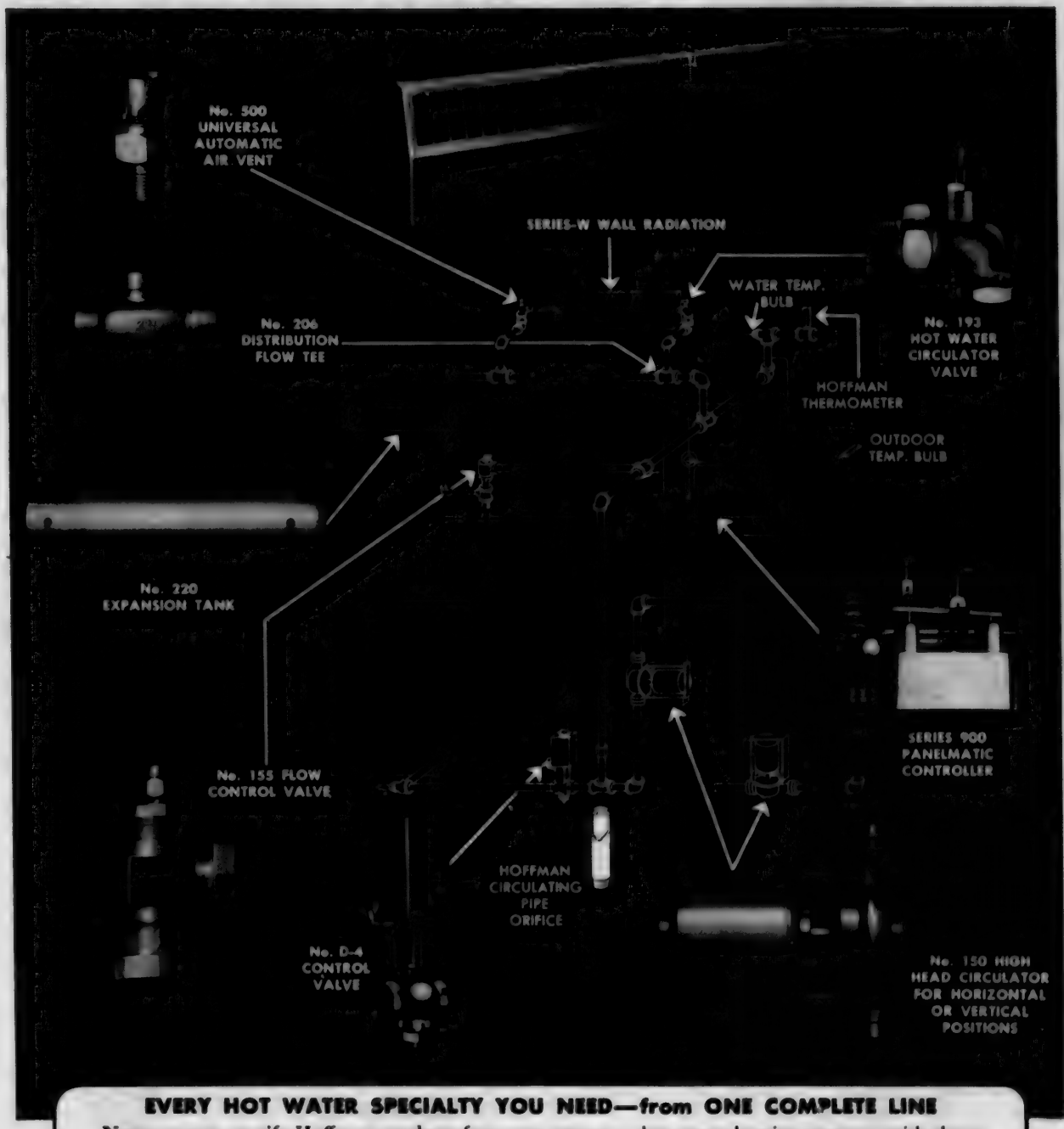
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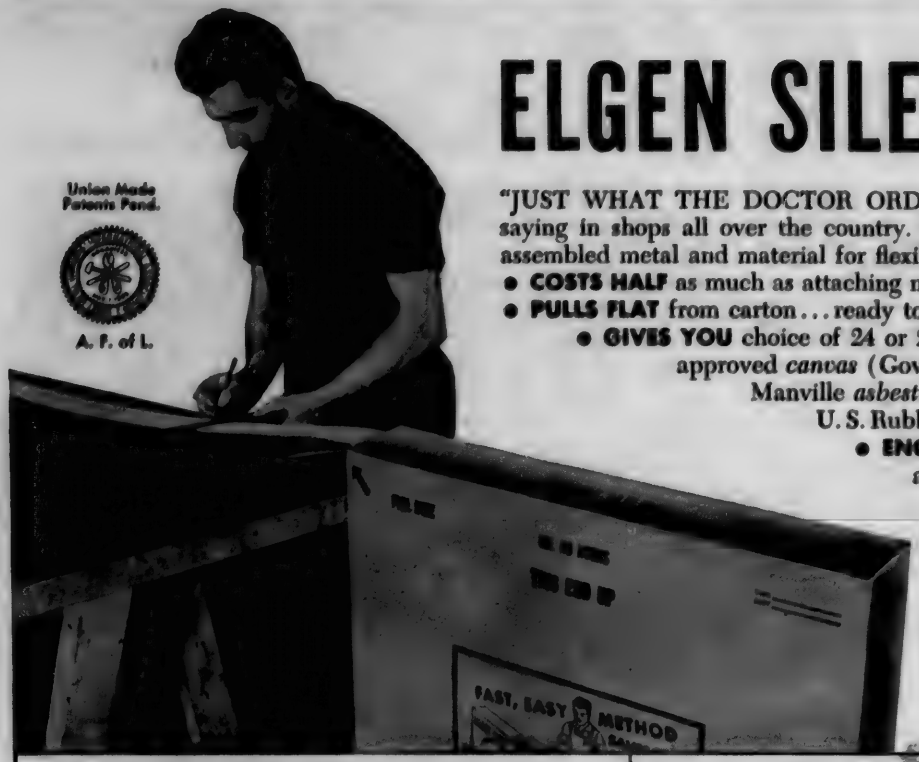

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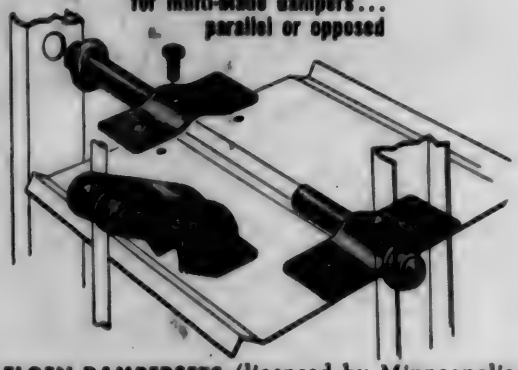

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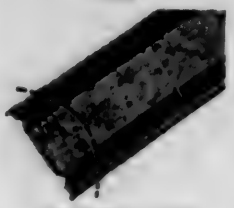
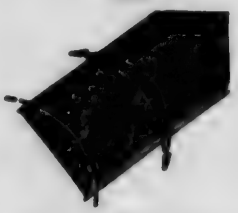


FOR SINGLE BLADES ONLY

BUTTON TYPE



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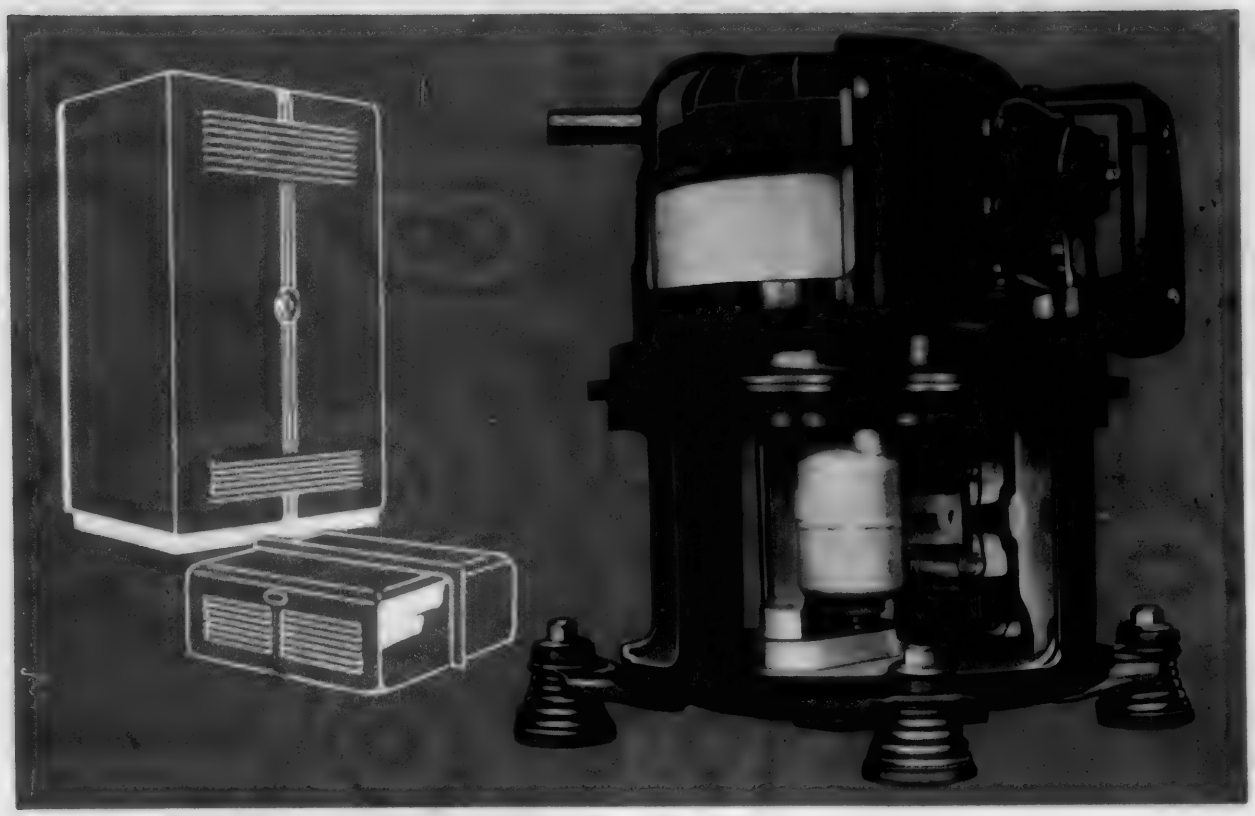

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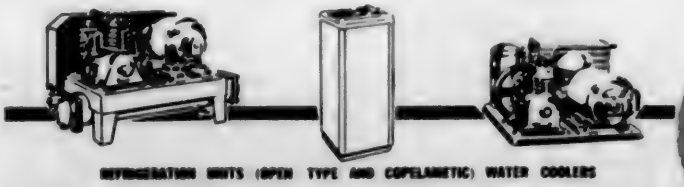
It takes real engineering (and knowledge of your customers' needs) to produce a welded motor-compressor that combines positive performance, vibration-free smoothness, and maximum operating economy.

Copeland gives you these design advantages and more . . . plus precision manufacture using finest components. Heavy-duty, high-power-factor motor delivers power aplenty with minimum current consumption. Freon-12 and Freon-22 models available. Use of Freon-12 can give you as much as 75°F. lower temperatures in windings, crankcase, oil and discharge side. Unusually high capacities make Copelaweld motor-compressors adaptable to virtually every type of duty.

Power all your air conditioning and refrigeration equipment with Copeland motor-compressors. It's *the* quality equipment that enhances your reputation by its long-run, trouble-free service.

Get full details . . . write today for complete information on the profit-making Copeland line.



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. . . 311 MARLO "SEAZONAIRES" comfort-condition new Washington Circle Apartments

These handsome remote room air conditioning units assure dependable year-round comfort for residents of the smart new Washington Circle Apartments at 25th and K Streets, N. W., Washington, D. C.

Styled to harmonize with any interior, Marlo Seazonaires provide delightful coolness in summer, warmth in winter . . . with temperature selected by the guest.

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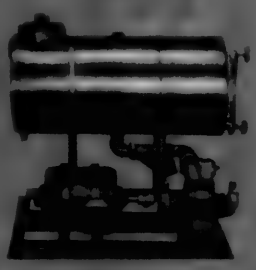
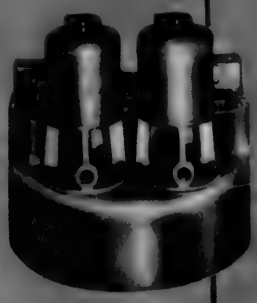


"TM" TURBINE PUMP
Designed for boilers up to 250 hp and discharge pressures up to 150 lbs.

"VV" CONDENSATE PUMP
Capacities ranging from 2,000 to 40,000 sq. ft. EDR, and discharge pressures from 10 to 75 lbs.



"CV" VERTICAL PUMP
Heavy duty duplex unit with two float switches. Capacities ranging from 500 to 10,000 sq. ft. EDR and discharge pressures from 10 to 20 lbs.

"CV" VERTICAL PUMP
Capacities ranging from 500 to 10,000 sq. ft. EDR and pressures from 10 to 20 lbs.

Skidmore Pumps

for top performance there is no equal

"HS" CONDENSATE PUMP
Capacities ranging from 1,000 to 15,000 sq. ft. EDR and discharge pressures from 10 to 75 lbs.

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Write us the type of Skidmore Pump you are interested in — we'll send brochure with full information.

- **Compact, modern design — but readily accessible for inspection.**
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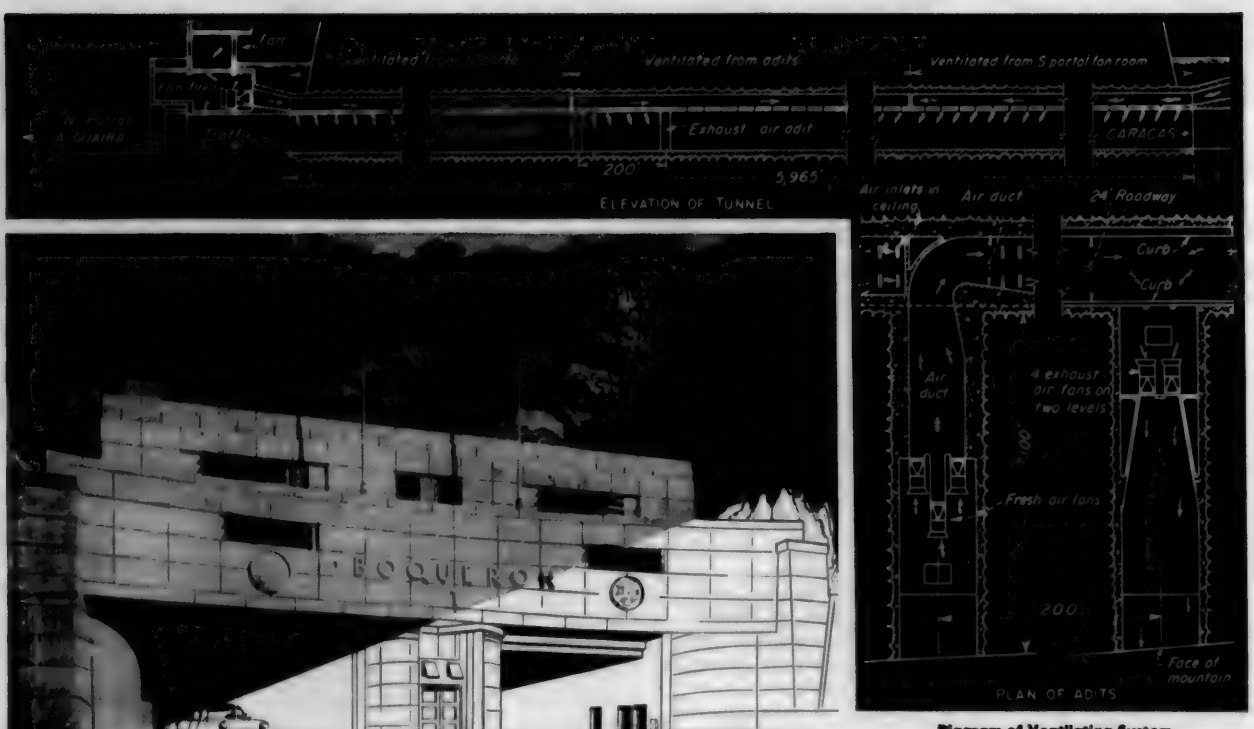
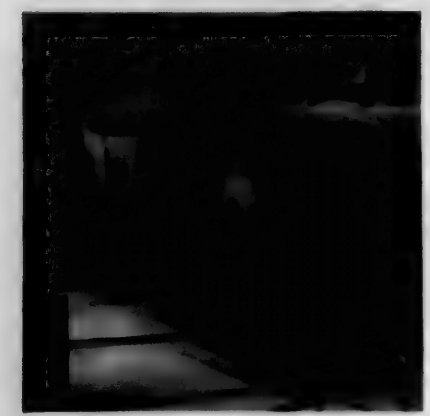


Diagram of Ventilating System Boqueron Tunnels

AIR FOR BOQUERON TUNNELS

...125 TONS A MINUTE



84" Joy Fan at Boqueron South Portal. Total available horsepower on job is 2115. Individual fan capacities range from 88,000 to 208,000 cfm at static pressures from .75" to 4.0".

VENEZUELA'S BOQUERON TUNNELS, on the Caracas-La Guaria expressway, use a vent system of 24 Joy Axivane fans . . . largest installation of its design in existence.

Shortest of the two twin-bore tubes (1634') is serviced by five 72" blowing fans above the North portal.

Venting the 6055' tunnel is more complex. Nine 72" and ten 84" fans are mounted above the portals and in two adits at quarter points (see diagram). Exhaust air is handled by four of the 84" units in one of the adits. Fan speed is automatically regulated by traffic conditions.

The Joy-designed drive arrangement eliminates power loss and maintenance. The 72" fans are powered by direct-connected, two-speed motors. The 84" units utilize wound-rotor and squirrel-cage motors mounted in tandem.

Joy Axivane Fans were selected because of their well-known high-capacity/low-power-consumption characteristics. Other contributing factors were the inherent structural strength and compactness of the vaneaxial design.

For complete information on Joy Series 1000 Axivane Fans, write for Bulletin J-611 to ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

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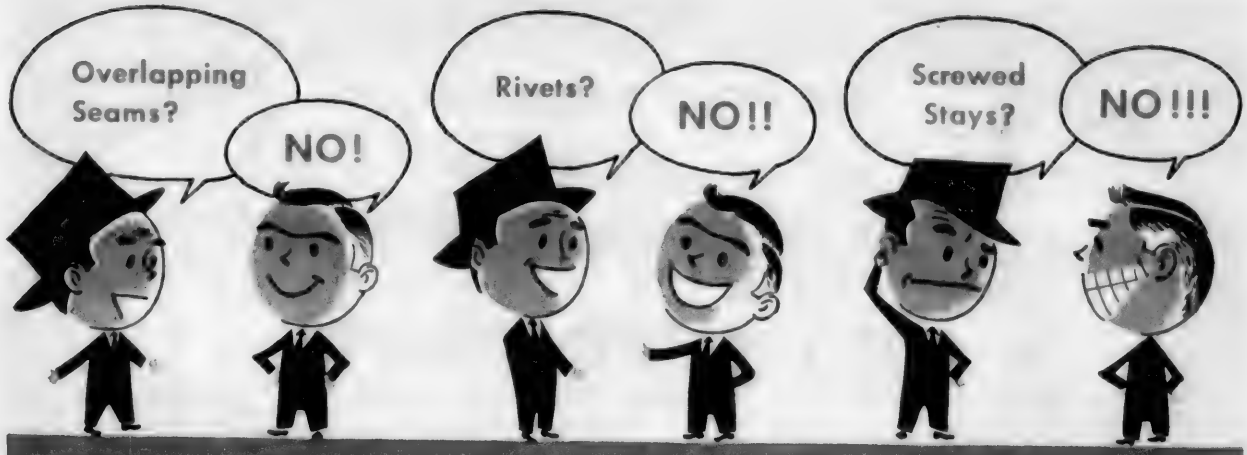

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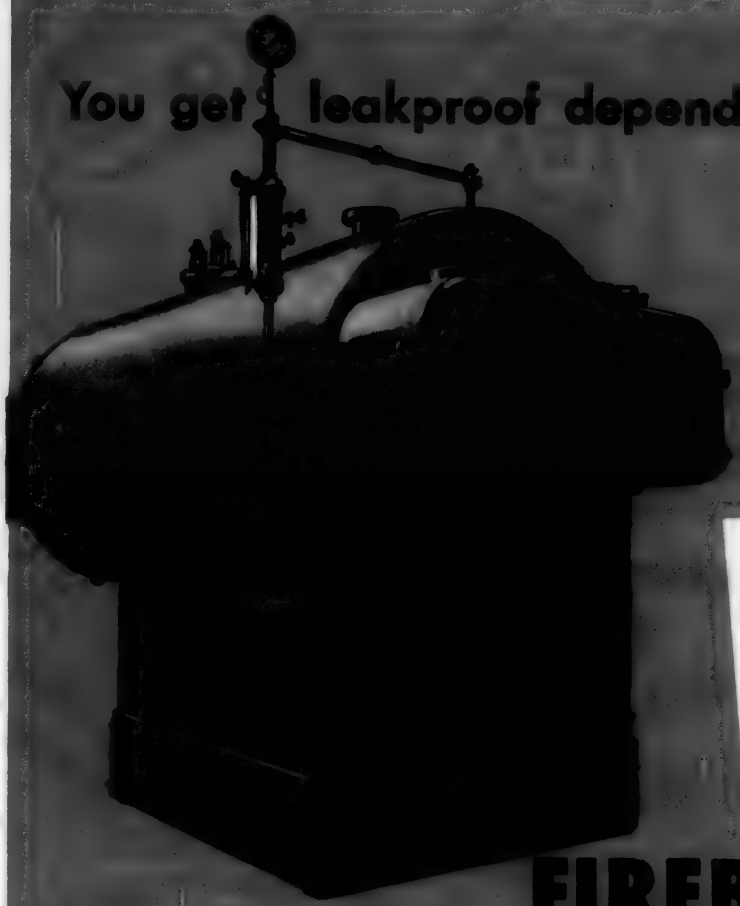
All-Welded All-Around

TITUSVILLE Type WP

FIREBOX BOILER



Twelve sizes to cover service requirements from 25 H.P. to 304 H.P.

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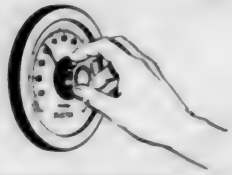

CONTINUOUS FLOW

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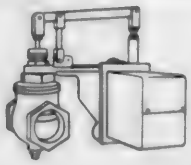

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To the architect and engineer an Illinois Control System of Steam Heating means lasting client satisfaction; to the heating contractor, simplicity and ease of installation; to the owner, a sound investment in comfort, convenience and fuel economy.

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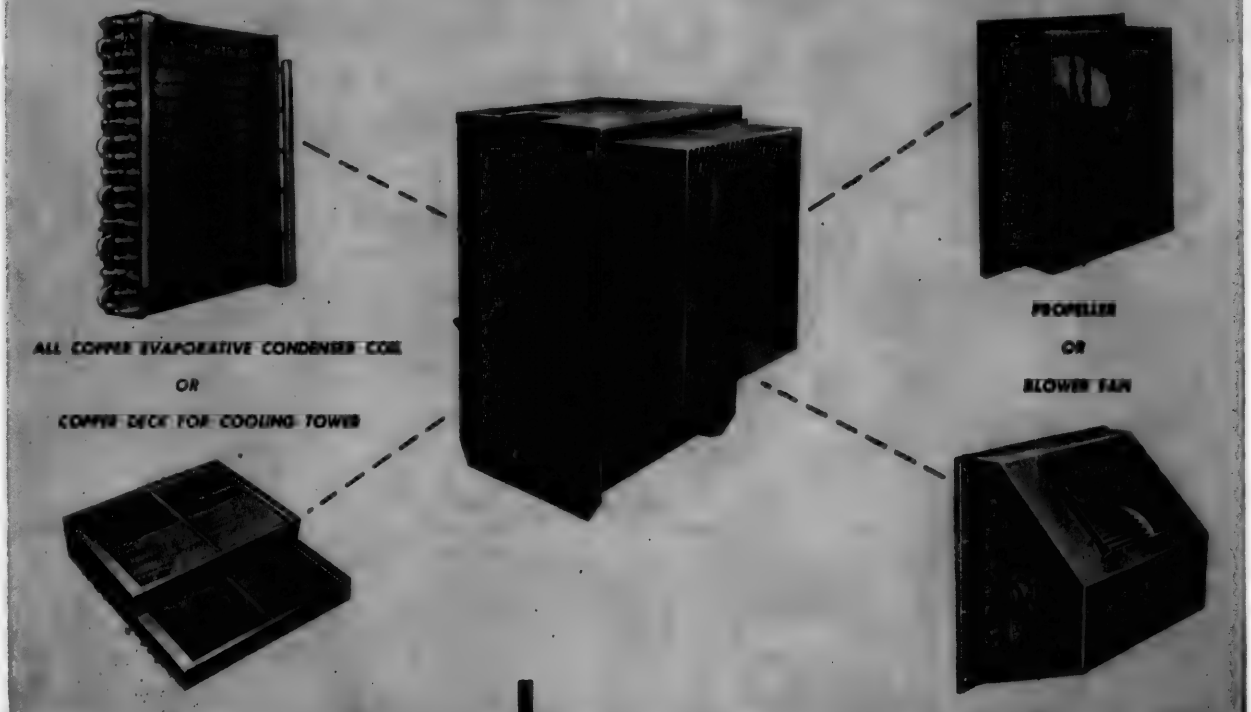

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Inner-Fin Evaporative Condenser Coil (All Copper) or Copper Deck Cooling Tower with Propeller Fan or Blower Fan.

You'll find FLEXIBILITY in these Bush Water Savers, never before available. And Bush FLEXIBILITY enables you to maintain a *complete* stock, without being burdened with excessive inventory. Bush standardization makes this possible.

LOOK AT THESE COMBINATION POSSIBILITIES!

A Cooling Tower (with exclusive Copper Decking) can be used with either Propeller Fan or Blower Fan.

A modern Evaporative Condenser by simply replacing the Copper Decking with Bush's exclusive Inner-Fin coil.

Cooling Tower or Evaporative Condenser, you'll be completely astounded by the *compact size.*

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BUSH

BUSH MANUFACTURING COMPANY

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Get the same air delivery with only ⅓ the weight!

New COOK all-aluminum belt-drive centrifugal ventilator

Model BD-43 is only 41½" high, delivers up to 12,000 cfm

- Saves up to 400 lbs. on large models
- Only 6" high roof curb required
- Weatherproof aluminum shell and base
- Aluminum centrifugal wheel
- Compact belt-drive
- Low silhouette
- Non-overloading wheel, low tip speeds
- Rubber-mounted drive assembly
- From 1,000 to 12,000 cfm

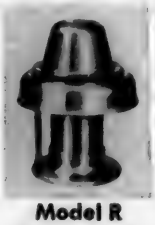
HINGED HOOD By lifting the hinged hood, motor and belt-drive are accessible for inspection.

The new Cook Model BD belt-drive ventilator eliminates heavy roof loads. Model BD-43, 12,000 cfm size, weighs only 250 pounds. Low tip speeds assure quiet operation. Light starting torque of the aluminum blower wheel increases bearing, motor and belt life. Only a six-inch high roof curb is needed, reducing installation cost. The entire shell can be lifted off by removing four bolts, making the Model BD easy to handle during installation . . . and easy to clean. Write for Catalog HBD, Loren Cook Company, Depot and Runn Streets, Berea, Ohio.

COOK Aluminum Direct Drive Ventilators

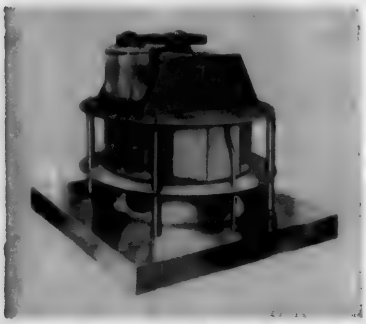
Model BV 300 Series
18" to 30"

Model BV 200 Series
9" to 21"



Model R
7", 9", 10"

Cook Direct Drive Ventilators are shown in the 1955 Sweet's Architectural File, sec. 19 b/Co



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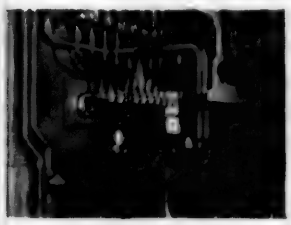

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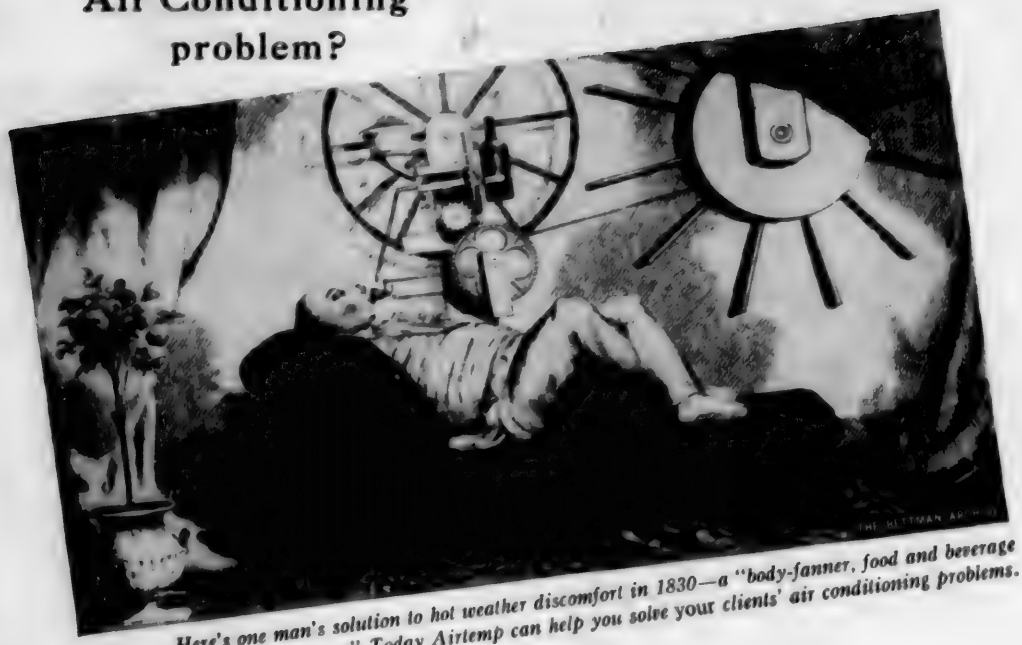

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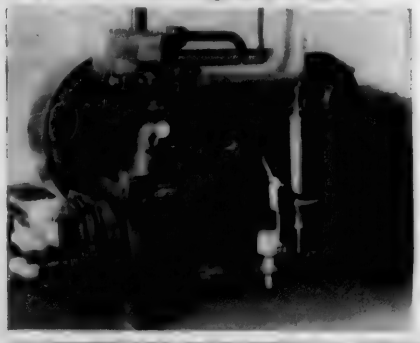
Combined ammonia units are manufactured in three sizes ranging from 2½ to 10 tons of refrigeration. They are a popular choice for food service, cooling drinking water, making ice, dairy plants, etc.

Frick low pressure units are built in 36 sizes from ¼ to 15 hp. Condensers on smallest machines are air cooled; on intermediate sizes, air or water cooled; and larger sizes, water cooled.



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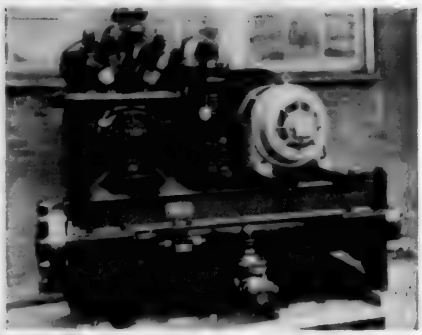
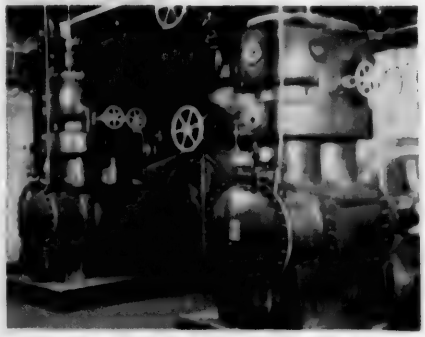
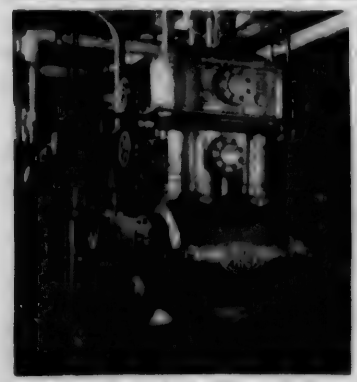


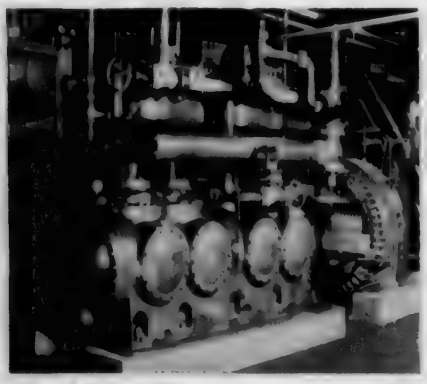
"ECLIPSE" Type PF low pressure units are furnished in 15, 20, 30, 40 and 60-hp. sizes. Shell-and-tube coolers may be added to form compact water chilling units.

Frick Company pioneered the development of the booster compressor. Since 1929 these Type PB machines, built in seven sizes, have been regularly installed by ice cream and quick freezing plants all over the world





Frick two-cylinder enclosed Type V.S.A. ammonia compressors have been perfected over the past 40 years, until today they are the standard of the industry. They are available in capacities from 2 to 300 tons, in 11 sizes.



Four-cylinder Type V.S.A. enclosed compressors are normally offered in four sizes with capacities up to 800 tons. Furnished with capacity controls on each cylinder, these machines give the user maximum flexibility and durability on heavy-duty refrigerating service, such as in the food and chemical industries.

Frick four-cylinder Type PB enclosed V.S.A. ammonia booster and Freon-12 compressors are available in 15" by 10" and 17¼" by 12" sizes. Seabrook Farms, the world's largest quick-freezing plant, has eight of the larger size.

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No longer is it necessary for the Engineer to accept a vacuum heating pump with air and water capacities based inflexibly upon square feet of equivalent direct radiation. With the flexible Nash CSM he can provide for proper air capacity in accordance with his judgment and experience. For the individual capacities of the separate pumps on the CSM may be varied within a wide range, without buying an oversize receiver and oversize water pumps.

These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low, returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- Increased air capacity induces rapid system response without wasteful overheating.
- Separate air and water pumps individually selected to meet actual job requirements.
- Control system that operates individual pumps only when needed.
- Flexibility permitting addition of radiation without changing basic pump installation.
- Low, low, return line connection.

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INDUSTRIAL REODORANTS

Their Uses in Plant Air Conditioning Systems

BRECKINRIDGE K. TREMAINE

Technical Director, Rhodia, Inc., New York, N. Y.

Industrial reodorants are specifically selected masking agents capable of cancelling objectionable plant odors by superimposing pleasant odors. While the principle is not new except in its mode of application, the development of products for use as reodorants has progressed markedly under influence of the earlier work of the du Pont Company and recently by Rhodia, Inc.

IT has been demonstrated that improvement in plant interior atmosphere is possible if specially designed reodorants are used. These products when applied in an aqueous air scrubbing system, for both circulated and recirculated air, will help to correct an interior nuisance, or musty, depressing atmosphere at a low unit cost and without large capital expenditures. In some cases, as little as one-tenth of a part per million parts of air provides a clean pleasant odor without excessive sweetness or obvious aromatic scent. Application can be made mechanically without excessive foaming in high pressure jet-type spray washers. Costs for daily application of a selected reodorant may average less than one cent per unit per hour of operation.

Theory of Odor

To date there is no known yardstick for evaluating odor. An odor which appeals to one person may offend another. The average person cannot completely describe

Breckinridge K. Tremaine, after 27 years' association with E. I. du Pont de Nemours & Co., joined Rhodia, Inc., New York, in November, 1954, as technical director of its Industrial Alamask Reodorant Division. He had been on loan to Rhodia for the several months previous.

The Division had been purchased by Rhodia from du Pont earlier that year. Mr. Tremaine was largely responsible for the development of industrial reodorants used in both air and stream odor abatement, and has contributed a number of technical papers in the field of odor control. A graduate of the University of Delaware, Mr. Tremaine started his career with du Pont's organic chemical department as chemist and technical representative in Wilmington and New England. From 1930 until 1936 he was with Canadian Industries Ltd., as Ontario and Western District Manager for the company's Dyestuffs and Chemicals Division. He then returned to du Pont to work on market development for the Fine Chemicals Division, continuing in this work on a national basis until the start of World War II when he became assistant to the manager of production. In 1949 he was assigned to special development of aromatic chemicals for industrial markets, continuing in this field until the purchase of the Industrial "Alamask" Reodorants Division by Rhodia.

an odor. Even among the odor experts different word descriptions of an odor are the rule rather than the exception.

Considerable work has been done to produce objective methods for odor measurement. The lowest concentration of an odorous substance in air that may be identified as an odor has been designated as the M.I.O. (minimum identifiable odor). Dalla Valle in evaluating the odor nuisance of Kraft paper manufacture compiled a long list of odor thresholds. These data are presented in Table 1 quoted from *Odors—Physiology and Control*, by McCord and Witheridge, McGraw-Hill Book Company, Inc., 1949. It is apparent that no single pattern of chemical structure serves to establish a trend of odor properties, although various systems of classification have been proposed.

The principles of odor masking as stated by McCord and Witheridge are:

(1) Odor masking is the process of cancelling one odor by superimposing another odor to create a more overpowering sensation, preferably pleasant.

(2) The masking agent does not alter the composition of pre-existing odors, but simply covers such odors during the period of its addition to and presence in the air.

(3) Masking is an effect produced at the point of sense perception in the respiratory passages together with the final interpretation in the brain and does not constitute an aromatic correction of the aerial components.

(4) The application of an inherently pleasant masking agent to an offensive atmosphere may result in a final combination that is still objectionable as a consequence of odor incompatibilities.

(5) The objectionable odor concentration must not be so intense that the masking agent is itself required in objectionable concentrations. In such cases, other control methods are indicated.

Care must be taken never to use a reodorant to mask or cover up a toxic concentration of gas. Personnel in refineries and other industries are accustomed to the presence of odor as the signal when dangerous concentrations of gas are building up.

TABLE 1—THRESHOLD CONCENTRATIONS OF CHEMICALS CAUSING ODOR

Substance	Concentration causing faint odor mg per liter or Oz per 1,000 cu ft	Remarks
Acetaldehyde	0.004	Pungent
Acrolein	0.038	Acrid, burning fat
"Akrol"	0.01	Acrid, pine-tar, irritating
Allyl alcohol	0.017	Alcoholic, not unpleasant
Allyl Amine	0.067	Similar to ammonia. Irritating
Allyl disulfide	0.0001	Garlic odor. Decomposes
Allyl isocyanide	0.0043	Sweet but repulsive, nauseating
Allyl isothiocyanate	0.0017	Mustard-oil odor. Nose, eye irritant.
Allyl mercaptan	0.00005	Very disagreeable, garlic
Allyl sulfide	0.00005	Garlic odor
Ammonia	0.037	Sharp, pungent
Amylene	0.0066	Nauseating in high concentrations
Amyl acetate (iso.)	0.0006	Banana odor
Amyl isovalerate (iso.)	0.0008	Pleasant, Fruity
Amyl mercaptan (iso.)	0.0003	Unpleasant
Amyl sulfide (iso.)	0.0003	Strong, unpleasant
Benzaldehyde	0.003	Odor of bitter almonds
Benzyl chloride	0.0016	Lacrimator, aromatic
Benzyl mercaptan	0.00019	Unpleasant
Benzyl sulfide	0.0006	Unpleasant
Bromacetone	0.0005	Pungent and stifling
Bromacetophenone	0.00064	Lacrimator, like bromine
Butylene	0.05	Gashouse odor
n-Butyl mercaptan	0.0014	Strong unpleasant
n-Butyl sulfide	0.0011	Unpleasant
Carbon disulfide	0.0026	Aromatic, slightly pungent
Chloracetophenone	0.0085	Apple blossom odor. Strong lacrimator
-Chlorvinyldichlorarsine	0.014	Odor of geraniums. (Lewisite)
Chlorine	0.010	Pungent, irritating
Chlorophenol	0.00018	Medicinal odor. Phenolic
Chlorpicrin	0.0073	Flypaper odor
Coumarin	0.00034	Vanilla odor. Pleasant
Crotonaldehyde	0.021	Eye and nose irritant
Crotyl mercaptan	0.000029	Skunk odor
Cyanogen chloride	0.0025	Bitter almonds
Dichlordiethyl sulfide	0.0013	Garlic or horseradish odor (mustard gas)
Dichlorethylene (trans)	0.0043	Ethereal odor
Dimthyl trithiocarbonate	0.00018	Foul, disagreeable
Diphenylamine chlorarsine	0.0025	Slight odor
Diphenyl chlorarsine	0.0003	Shoe-polish odor
Diphenyl cyanarsine	0.003	Odor of bitter almonds and garlic
Diphenyl ether	0.000069	Geranium odor. Pleasant
Diphenyl sulfide	0.000048	Ethereal but unpleasant
Diphosgene	0.0088	Suffocating, disagreeable
Dithio-ethylene glycol	0.0016	Disagreeable, garlic-like
Ethylene dichloride	0.025	Aromatic, ethereal
Ethyl dichlorarsine	0.001	Irritating, biting
Ethyl isothiocyanate	0.038	Mustard oil, irritating
Ethyl mercaptan	0.00019	Odor of decayed cabbage
Ethyl selenide	0.000062	Garlic odor, putrid and nauseating
Ethyl seleno mercaptan	0.0000018	Very foul and disagreeable

(Continued on next page)

TABLE 1—THRESHOLD CONCENTRATIONS OF CHEMICALS CAUSING ODOR
(Continued)

Substance	Concentration causing faint odor mg per liter or Oz per 1,000 cu ft	Remarks
Ethyl sulfide	0.00025	Garliclike, foul, nauseating
Hydrogen cyanide	0.001	Odor of bitter almonds
Hydrogen sulfide	0.0011	Odor of rotten eggs, nauseating
Methyl anthranilate	0.00037	Floral essence, fruity
Methyl dichlorarsine	0.0008	Slight odor. Irritating
Methyl mercaptan	0.0011	Odor of decayed cabbage or onions
Methyl sulfide	0.0011	Odor of decayed vegetables
Methyl thiocyanate	0.0096	Odor of almonds. Unpleasant
Nitrobenzene	0.03	Odor of bitter almonds
Oxidized oils	0.0011	Unpleasant and irritating
Ozone	0.001	Slightly pungent, irritating
Phenyl isocyanide	0.000029	Repulsive, nauseating
Phenyl isothiocyanate	0.0024	Cinnamon odor, pleasant
Phosgene	0.0044	Odor of ensilage or fresh-cut hay
Propioaldehyde	0.0022	Acrid irritating
Propyl mercaptan	0.000075	Unpleasant
n-Propyl sulfide	0.00081	Foul, nauseating
Pyridine	0.0037	Disagreeable, irritating
Skatole	0.0012	Fecal, nauseating
Sulfur dioxide	0.009	Pungent, irritating
Thiocresol	0.0001	Rancid, skunklike
Thiophenol	0.000062	Putrid, nauseating
Trinitro butyl xylene	0.00001	Musk odor

Realization of the benefits obtained from employing special reodorants is best illustrated by their practical application in many industrial plants such as viscose rayon manufactures.

Malodors from the manufacture and processing of viscose are well known. It is not always possible to collect all exhaust fumes and to chemically recover the volatile sulfur compounds or to cause their complete destruction. Consequently, not only does the surrounding atmosphere become polluted near such operations, but often the interiors of the operation become malodorous. Rigid controls are practiced by all producers to maintain a uniform non-toxic interior atmosphere, since such malodorous fumes may contain excessive amounts of H_2S and CS_2. However, even with the best of housekeeping, a musty interior atmosphere may exist, particularly within the spin room areas, recovery, and wash drawn areas. Conditioning of circulated air is a must in any spin operation. Therefor, air scrubbing is a standard practice.

Extensive experiments in the introduction of reodorants into the air washers or scrubbers have been made successfully. In some cases, malodors drawn from a spin operation, where large denier yarns are prepared were treated with previously washed air containing a reodorant. The malodors drawn from such spin operations were fed treated air at one to four cubic feet per minute. Analysis of the malodorous gases drawn from over the spin operations showed 389 ppm H_2S at one cubic foot per minute and 122 ppm H_2S at four cubic feet per minute. Air replacement was at a rate of one change every minute or slightly less than a minute. Complete absence of malodor normally associated with the area was evident after applying the reodorant.

In further practical tests, application of the reodorant was made to improve the interior atmosphere in both spin and wash drawn areas providing a faint clean but not excessive odor. Prior to the application of the reodorant, the areas had a slight odor characteristic of CS_2. The reodorant was added to the scrubbing system for the incoming air by gravity feed using less than one ounce per hour. This was a closed system, having a circulation of 22,000 gallons of water per minute. The results were excellent for the entire area.

Similar applications of reodorants have also been made for industrial operations troubled by traces of malodors, fishy in character from handling amines, which normally are ammonical in character, until diluted in air to a few parts per million, where they become exceedingly objectionable.

In the application of reodorants engineering services are important for many reasons. First, the new principle requires the treatment of air prior to its saturation by a malodorous chemical or its compounds, not after it becomes contaminated. This is true, not only for industrial operations but for normal working and living conditions. Therefore, the reodorant selected must be designed chemically by engineers. Such reodorants must possess desireable characteristics for mixing rapidly under variable conditions of temperature, humidity and pressure.

Ceramic Coated Steel Resists Heat and Corrosion

The life of parts subject to high temperatures in heating equipment now can be increased from three to five times through the application of high temperature ceramic coatings. This new development consists of coating an entire exhaust system, both inside and out, with 0.001 to 0.002 inch of high temperature ceramic coating, which resists corroding gases and withstands extreme operating temperatures up to 2200 deg F.

"Based on the successful completion of laboratory work and a series of pilot projects," Robert A. Weaver, Jr., president of Bettinger Corp., Waltham, Mass., stated, "We are convinced that this advance in the technology of high temperature ceramic coatings will be as successful as our continuing work with the hot parts of jet engines, which began in late 1951".

Bettinger has solved production line problems involved in coating hot parts, including combustion liners and collector rings for the J-47 jet engine. This resulted in increasing the jet engine life span from three to five times. In addition, by coating low alloy steels with high temperature ceramic coatings, Bettinger enabled these metals to replace more costly and scarcer high-alloy steels.

How to Size and Install Gas Water Heaters Correctly

RALBERN MURRAY

Assistant Utilization Engineer, American Gas Association

Data are presented on the proper sizing of a gas-fired water heater to meet hot water demands. Also covered are pointers regarding the installation of such heaters, placement of relief valves, and measures to be followed for proper venting.

AUTOMATIC gas water heating is accomplished in two ways, by supplying hot water rapidly, or by storing it and refilling the storage tank as it is used. Several types of gas water heaters are in use today, including automatic storage, non-automatic storage, automatic circulating tank, automatic instantaneous and adjustable recovery heaters.

In the automatic storage type, the heater, storage tank, insulation and controls are all combined in a single unit. Heaters of this type can be secured with a storage tank varying in capacity from 10 gallons to 100 gallons. Recovery capacities range from 3.8 to over 150 gallons per hour based on a 100 deg rise in temperature.

Heaters of the automatic storage type are generally classified in accordance with the speed at which they can heat incoming cold water. The three major classifications are fast recovery, slow recovery, and adjustable recovery heaters. While the wording "fast recovery" is a relative term and cannot be precisely limited, it is desirable to define its meaning for practical usage. Any heater having a burner input of at least 1,000 Btu per hour for each gallon of storage tank capacity should be classified as a fast recovery heater. Such a heater would be able to recover its full tank capacity in a little more than one hour through a 100 deg rise in inlet water temperature.

The time required for a slow recovery heater to recover the storage tank capacity usually varies from about 3 to 10 hours. Slow recovery heaters are likely to run out of hot water when modern conveniences such as automatic home washers, dishwashers and other appliances are installed.

When economy is the major consideration, adjustable recovery heaters of two basic types are on the market. One type features adjustment by the customer, where extra demand can be met by turning on additional burner capacity manually. The second type is adjustable by the installer who, at a later date, can install a different burner to meet a new set of conditions.

Automatically controlled circulating tank heaters are frequently referred to as automatic side arm storage heaters or conversion heaters. For satisfactory operation, units of this type must be properly installed with particular attention paid to such details as storage tank material and condition, tank insulation, pipe sizes and material, relief

TABLE 1—DATA FOR DETERMINING PROPER SIZE OF GAS WATER HEATER

Number of Baths	Number of People	Automatic Home Washers	Temperature Rise Deg. 100	80	60 Hourly Recovery, Gal.	Input Rating Btu per Hr	Size of Heater, Gallons
1	1-3	No	22	28	37	26,800*	20*
1	1-3	Yes	24	30	42	30,000	20
1	3-4	No	17	22	29	21,000*	30*
1	3-4	Yes	21	26	35	25,000	30
1	3-5	Yes	24	30	42	30,000	30
1	5-6	Yes	28	35	49	35,000	30
1	5-6	Yes	16	20	28	20,000	40
1	6-7	Yes	24	30	42	30,000	40
2	4-5	Yes	24	30	42	30,000	40
1	8-9	Yes	33	42	56	40,000	40
2	5-6	Yes	33	42	56	40,000	40
2	6-7	Yes	37	47	63	45,000	40
2	5-6	Yes	24	30	42	30,000	50
2	6-7	Yes	33	42	56	40,000	50
2	8-9	Yes	42	52	70	50,000	50
3	5-6	Yes	42	52	70	50,000	50
3	5-6	Yes	24	30	42	30,000	60
3	6-7	Yes	33	42	56	40,000	60
3	7-8	Yes	42	42	52	50,000	60

*Minimum input for this size storage tank which will meet FHA requirements.

valve location, drain faucet, thermostat location, venting and other similar items. As the installed cost of these heaters is usually not much less than for a self-contained galvanized automatic storage heater, their application is limited and may not be warranted unless a non-ferrous tank in good condition is already installed and in use on the premises.

The automatic intantaneous or continuous flow type of water heater is a self-contained unit including a large copper coil suspended above a battery of burners and all enclosed within a casing, together with necessary valves and thermostats. They are recommended for intermittent demand where hot water storage is wasteful; for hot water demands for long periods that would exhaust tank supply; for water conditions that corrode iron tanks where non-corrosive tanks are impracticable. They are used most frequently in clubs, shower baths, industrial washrooms, gymnasiums, ball parks and recreational centers. Instantaneous heater capacities range up to 4.5 gpm at 100 deg. rise, or 270 gallons per hour. Gas boilers equipped for hot water service with delivery rates of about 3 gpm are also avaliable.

Tank Materials

Since automatic storage water heaters are the preferred type, consideration of tank materials is quite important. Many factors enter into this selection such as initial cost, chemical composition and the quantity of impurities in the water supply, problem and cost of replacing the tank at a future date, temperature of hot water, and size of tank required.

Types of tanks include galvanized steel, glass-lined steel, copper-lined steel and non-ferrous metal tanks.

The useful life of the galvanized tank varies widely depending principally on the water temperatures to which it is subjected and on the nature of the chemical compounds in the water. Water temperatures in excess of 160 deg greatly increase the rate of tank corrosion. As the life of the water heater is usually determined by the life of the tank, the lower initial cost of a galvanized tank is frequently a false economy from a long range viewpoint. Protection by sacrificial magnesium anodes often extends the useful life of the tank in a substantial manner.

Use of glass-lined tanks is quite satisfactory provided reasonable care is taken in the handling and installation so as not to crack or damage the lining. If brass connections are used in lined steel tanks, the water connections should have long threads to permit turning far enough into the tappings to protect the uncovered portion of the steel.

In areas where the water is highly corrosive or for installation where high hot water temperatures are desired, storage tanks made of nonferrous materials are recommended. Monel metal, a copper nickel alloy, silicon bronzes, and aluminum are most generally used for tanks in automatic storage heaters.

Sizing

A properly sized water heater should be large enough to provide a margin of extra capacity to meet any unusual or possible future demand. In selecting the heater size for any installation it is important to determine the temperature rise through which the water must be heated. To do this the lowest temperature at which water is supplied in a given area must be subtracted from the desired thermostat setting.

Automatic storage water heaters appear to supply all of the hot water from storage but recovery goes on even while water is being drawn. For a given hot water demand, a small storage tank capacity requires a higher input burner than would a heater having a larger tank.

Type and size of automatic storage heater to be selected depends on the following factors: Amounts of hot water needed per day, distribution of hot water throughout the day, taking into consideration peak demands, number of degrees rise in water temperature, income level and living standards of the family, type of fuel, and availability of fuel.

The latter two points are of prime importance in the selection of the proper size water heater. An electric water heater in order to have an equivalent deliverability of hot water when compared with a gas water heater must necessarily have about twice as much storage capacity. This is the result of low wattage heating elements being used and the fact that in certain areas electricity is available for hot water heating only part of the day.

Table 1 can be used to determine the proper size gas hot water heater to install for various home conditions.

When unusual water demands are anticipated, a more precise method of determining recovery capacity and storage tank size is necessary. Just to get an idea as to how much hot water is used for various purposes under typical circumstances, which of course might not fit every case, consider the following estimates:

Usage	*Gal.*
Tub bath (adult)	10
Tub bath (baby)	3
Shower	8
Shower, needle	24
Dishwashing per person per meal	½
Laundry per person	4
Cleaning per day	5
Personal toilet per person	1
Automatic laundry	15-25

These data can be used to calculate the hot water demand. After the hot water demand has been determined a heater can be selected large enough to meet the greatest hourly demand. The temperature rise through which the water must be heated should be determined to select the recovery capacity.

Numerous tests have been conducted at scattered points in this country to establish the average monthly use of hot water per person. A useful rule of thumb is 10 gallons of hot water per day per person, or 300 gallons per month, to which must be added the hot water losses in leaky faucets and heat losses from the piping system.

Location

The location for a water heater should be carefully considered in light of air supply, venting and hot water service. Water heaters approved by the American Gas

TABLE 2—WATER HEATER CLEARANCES

Type of Heater	Distance from Combustible Walls, Inches	
	Nearest Part of Jacket	Flat Side
Type A	6	....
Type B	2	....
Type C	..	Flush

Association are tested in accordance with the American Standard Approval Requirements and classified as follows:

Type A—Miscellaneous (including circulating tank, instantaneous, uninsulated underfired).

Type B—Underfired, insulated automatic storage heaters.

Type C—Type B units with one or more flat sides and tested for installation flush to wall.

Such approved heaters are tested to insure that the temperature of adjacent combustible walls and surfaces will not be excessive when installed with clearances specified in Table 2.

All water heating equipment not tested and approved under the above-mentioned A.S.A. Approval Requirements should be installed with at least 12 in. clearance from combustible walls. Combustible floors under unlisted water heaters shall be protected in an approved manner.

In general, heater shells should be kept 10 in. from furnace flues or other hot surfaces to prevent discoloration of shells.

It is most important that the heater be near the frequently used faucets and close to a good chimney or stack. It should not be placed in a cubby hole or closet unless one side is permanently open to provide ventilation. Water heaters shall not be installed in bathrooms, bedrooms or any occupied rooms normally kept closed. Every water heater should be so located that it will be readily accessible for operation, maintenance and servicing.

Water heaters need adequate air supply for burning the gas and at the same time they ought to be put as close to the chimney as practical.

A level solid fixed base assures proper safe operation of a water heater.

Heaters in Enclosed Spaces

Water heaters in enclosed spaces may be unsafe, and heater servicing is made difficult by lack of room to get at controls. Confined installations may need the protection of fireproof materials unless the heater is approved for flush mounting or close clearance. Adequate air supply may be obtained for closet installations by use of two permanent openings freely communicating with the interior of the house, one near the top and one near the bottom of the enclosure. If necessary, rectangular ducts with a minimum dimension of not less than 3 in. and with cross-sectional areas equal to the openings should be used to reach the source of air supply. One square inch of free area should be provided per 1,000 Btu per hour of input rating for each opening.

Water heaters in closets or in unusually tight buildings must have two air supply connections to outdoors or to a crawl space or attic. Under these conditions, the total area of the top and bottom openings should not be less than 1 square inch per 1,000 Btu per hour of input rating. These openings shall be of approximately equal area and should communicate with the selected source or sources of adequate air supply, by ducts. Where ducts are required, they should be continuous and of the same cross-sectional area as the openings to which they connect. The minimum dimensions of rectangular air ducts should not be less than 3 in. Any duct from the top opening must be horizontal or pitched upward.

The same venting practice should also be followed for water heaters installed in a full basement within a building of unusually tight construction.

Operation of attic exhaust fans, kitchen ventilation systems, or fireplaces, may occasionally set up negative chimney draft. This must be corrected. It may be possible to add an air duct to the outside. Another corrective method is to install a mechanical vent.

Relief Valves

Installation and adjustment of temperature, pressure and vacuum relief valves, or combinations thereof, and automatic gas shutoff valves should be made in accordance with the requirements of the proper administrative authorities, or with the manufacturer's instructions accompanying such devices.

Drains from relief valves should always be of the open discharge type and should be of sufficient size to assure proper relief. Drain lines should lead to an open drain to protect the water heater and surroundings from water discharge when the relief valve operates due to excessive temperature or pressure. It is recommended that waste lines from relief valves be made of non-ferrous pipe or tubing.

Although a pressure relief valve sometimes is not required on direct connected open water piping systems, it is a useful accessory. For closed systems, where there is a water meter, check valve or pressure reducing valve, it is absolutely necessary to have some form of water pressure relief valve. No manually operated valve should be placed between the relieving device and the tank.

The pressure relief valve is generally installed in the

TABLE 3—WATER REQUIREMENTS FOR VARIOUS FIXTURES
(Based on 2 to 4 lb pressure at the fixture)

Fixture	Gallons of Water per Minute*
Washroom lavatory	1½ to 2
Kitchen sink:	
½ inch	2 to 3
¾ inch	3 to 5
Bathroom lavatory	2 to 3
Bath tub (15 gallons mixed hot and cold for one bath)	3 to 4
Laundry tub	4 to 6
Shower bath:	
4 inch	3 to 6
5 inch	6 to 8½
6 inch	8 to 10
Water closet:	
Tank	4 to 6
Flush valve	20 to 25

*Minimum flow is generally ample.

cold water inlet line. When corrosive or hard water is involved, this location is essential, but the valve must be placed where the water will not be heated by conduction from the tank.

Both the spillage-type temperature relief valve and the thermal expansion type pressure relief valve should have a minimum outlet size of ½ in. IPS.

The immersion-type high limit energy cut-off device or temperature relief valve should be installed so that its temperature element is immersed in the hottest stored water:

1. Within the top 6 inches of the tank of an underfired water heater;
2. Above the hot water inlet to the tank supplied by a sidearm water heater.

Combination temperature pressure relief valves should be installed to conform with the recommendations for a temperature relief valve.

Water Piping

The following information regarding connections to water piping should be considered general in nature and used as a guide for the installation of water heaters. Flow tables and useful data have been condensed for practical application.

Local ordinances should be known and observed in all cases.

All water heating systems should have a drain or blow-off cock attached to the storage tank both for removing sediment and for draining if the house is to be vacant in freezing weather. Sediment should be removed about once a month by withdrawing a bucket of water.

Copper tubing should be securely supported for protection and to prevent rattling when water valves are closed.

Pressure reducing valves act as check valves and may cause pressures even higher than street water main pressures due to expansion of water being heated while no water is being drawn. The need for a pressure relief valve in such systems is self-evident.

Water valves in circulating lines should be of the gate valve rather than globe valve type so that they will cause a minimum obstruction to the flow of water through the valve.

Corrosion

Where corrosive conditions exist, due to electrochemical action of unlike metals in heater tanks and water systems, or where stray currents from outside sources enter the water system, protection can be provided by the use of insulating nipples, bushings, unions, or gaskets, connecting the water system to the hot water heater. They should be installed directly on the inlet and outlet connections of the water heater.

TABLE 4—HOT WATER CAPACITY OF FERROUS PIPE

Pressure Drop in Pipe, Psi per 100 Ft	Pipe Size, Inches				
	½	¾	1	1¼	1½
	Gallons per Minute				
5	2.0	5.4	11	19	30
7	2.3	6.4	13	23	36
10	2.8	7.6	15	27	43
20	4.0	10.8	22	38	61
30	4.9	13.2	27	47	76
40	5.6	15.0	31	54	86

TABLE 5—HOT WATER CAPACITY OF COPPER TUBE

Pressure Drop in Pipe, Psi per 100 Ft	Pipe Size, Inches			
	¼	⅜	½	¾
	Gallons per Minute			
5	0.99	2.08	3.92	8.25
7	1.19	2.52	4.75	9.99
10	1.47	3.11	5.88	12.38
20	2.17	4.60	8.68	18.27
30	2.73	5.76	10.88	22.90

The cold water supply for any installation must be adequate to supply both the cold and hot water combined instantaneous demands at any time. Sizes of water services, meters and supply lines for large consumption, should be checked by the use of a water flow table. For private homes, 1 in. iron pipe size services should be the minimum. House lines of ¾ in. iron pipe size should be the minimum. Sizes of supply and branch lines should conform with local codes. Where local water conditions cause internal pipe incrustations, allowance must be made in sizes of lines, or non-corrosive pipe materials should be employed.

Unless water line pressures are maintained constant and adequate, it is advisable to base cold water pipe sizes on not over 10 psi drop per 100 ft of length. Under some conditions this may be increased to 20 lb and where constant flow is desired, pressure drops of less than 10 lb should be used. An allowance must be made for static head at the rate of 0.43 lb for each foot of vertical rise above the source of supply. An allowance for pressure drop in fittings and fixtures should also be made. For iron pipe installations, this should be approximately 4 lb. for each valve, fitting or fixture and 3 lb. each on copper tubing installations.

Table 3 shows water requirements for various fixtures based on having 2 to 4 psi pressure at the fixture when water is flowing at the full rate.

Tables 4 and 5 show pipe capacities at various pressure drops per 100 ft.

Each branch line should be sized independently, and a calculation made beginning with the available pressure at the branchoff point.

Compact Design

In the past, hot water and cold water piping systems have been fairly similar. Efficient design calls for a central location of the water heater with short lateral runs with emphasis on the most used faucets, kitchen sink and bathroom lavatory lines. Use of individual small diameter lines to these and other outlets affords the most economical hot water service.

Depending on temperature difference between water and room temperatures, a water line cools off if 20 to 30 minutes elapses between successive withdrawls from a faucet. That means that a pipe full of water, plus an additional allowance for re-heating the pipe, must be wasted before hot water is again available at the faucet.

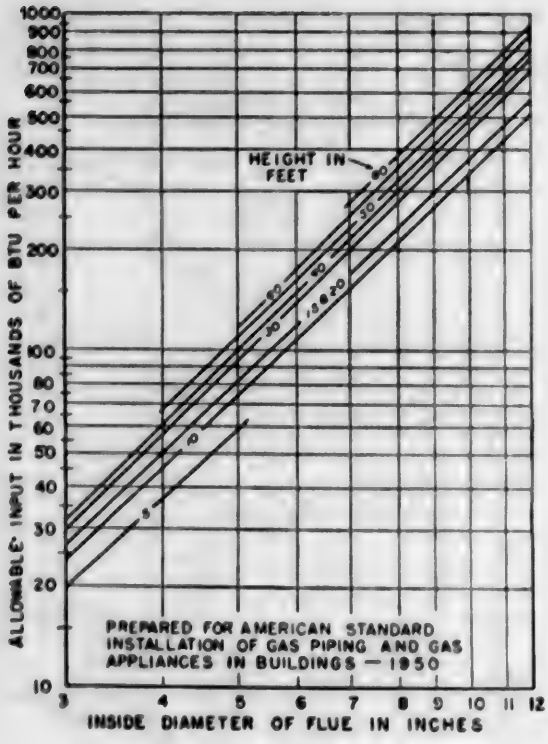

Fig. 1. Flue sizing chart.

This loss can add materially to water heating costs where lines are long or where the interrupted use of faucets is high. Added convenience is gained by tubing installations in that hot water reaches the faucet quickly. Possibility of added losses due to the circulation of hot water in the smaller lines is also reduced. Where individual branch lines are not practical, pipe sizes for combined flow requirements can be calculated the same as for cold water piping.

Venting

Every water heater should be connected to an effective flue or vent if the water heater has an input over 5,000 Btu per hour.

Where a draft hood is a part of the appliance, or is supplied by the manufacturer, it should be installed without alterations in accordance with the manufacturer's instructions. In the absence of such instructions, the draft hood should be attached to the flue collar of the appliance, or as near to the appliance as conditions permit.

If the draft hood is not a part of the appliance, or supplied by the manufacturer, it should be supplied by the installer and, in the absence of other instructions, should be the same size as the appliance flue collar.

In no case should a draft hood be installed in a false ceiling, in a different room, or in any manner that will permit a difference in pressure between the draft hood relief opening and the combustion air supply.

A draft hood should be installed in the position for which it was designed with reference to the horizontal and vertical planes and should be located so that the relief opening is not obstructed by any part of the appliance or adjacent construction.

No damper should be placed in any flue or vent connection of the water heater. Fixed baffles ahead of a draft hood are not classified as dampers.

By definition, a chimney is restricted to mean a vertical shaft of masonry or reinforced concrete, enclosing one or more flues—a Type A chimney. Underwriters' Laboratories, Inc. recognizes a Type B flue for venting gas appliances. This is a flue not requiring enclosure in a masonry or concrete chimney. Type C flues, made of 24 gage copper or 20 gage galvanized iron or equal in corrosion resistance, can only be used for runs directly from the space in which an appliance is located to the outer air without passing through any other concealed space or floor.

Before connecting a flue or vent connector, the flue or vent shall be examined to ascertain that it is properly constructed, clear, and will freely conduct the products of combustion to the outer air.

The flue or vent to which the flue or vent connector is connected shall be of a size not less than specified in Fig. 1. In no case shall the area be less than the area of 3 inch diameter pipe. When more than one appliance vents into a flue or vent, the flue or vent area shall be not less than the area of the largest flue or vent connector, plus 50 per cent of the areas of the additional flue or vent connectors. An elliptical flue or vent may be used, provided the flue gas venting capacity is equal to the capacity of round pipe for which it is substituted.

The flue or vent should extend high enough above the building or other neighboring obstruction so that wind from any direction will not strike the flue or vent from an angle above horizontal. Unless the obstruction is of great magnitude, it is usual experience that a flue or vent extended at least 2 ft above flat roofs or 2 ft above the highest part of wall parapets and peaked roofs within 30 ft will be reasonably free from down drafts.

Natural draft vents extending through and terminating adjacent to outside walls are prohibited. Such installation may be made if mechanical exhausters are used.

Chimney cleanouts shall be of such construction that they will remain tightly closed when not in use.

When an existing chimney is unlined, or where local experience indicates that flue gas condensate might be a problem, consult the local gas company for information about liners that are suitable for the locality.

Outside flues or vents are not recommended and they are particularly unsuccessful in severe climates and in small sizes, but when they must be used the material shall be resistant to the action of combustion products and shall possess high insulation qualities or be adequately insulated to minimize condensation.

When a flue or vent must be installed on the outside of the building, it shall be securely supported. A capped tee shall be installed at the base of the riser with an opening to drain off condensate. A suitable vent cap which does not obstruct or reduce the effective cross-sectional area of the flue or vent outlet shall be placed on top of the riser.

Flue or vent connectors should maintain a pitch or rise from the appliance to the flue or vent. A rise as great as possible, but at least ¼ inch to the foot (horizontal length), should be maintained. The maximum horizontal run should not exceed 75% of the height of the flue or vent.

Design Corrections for Altitude

NEAL L. VINSON

While designs are prepared for various altitudes, most rating tables and design procedures are based on sea level conditions. This article covers the correction requirements for various applications within the fields of heating, ventilating, air conditioning and refrigeration.

DESIGNS of heating, ventilating, air conditioning, and refrigeration systems are prepared at locations all over the world for installations at widely varying altitudes above sea level. Unfortunately, most rating tables and design procedures are based on conditions prevailing at sea level, with necessary correction factors for other than sea level applications either omitted or treated so casually as to make the correction either excessively difficut or to require application without full confidence.

Therefore, the purpose of this article is to consider the correction requirements for various applications within the design fields mentioned and to develop some of the correction techniques involved.

A logical approach to these correction problems is to consider the effect of variable ambient pressures on the air which is used to transport or transfer energy in the form of heat or moisture.

General Discussion

The weight of a cubic foot of free, dry air at a given temperature changes with its elevation—decreasing as the elevation increases. Because this is so, a reference value for the weight of a cubic foot of dry air at mean sea level and at a temperature of 70F is established as a standard. Its numerical value is taken as .075 lb per cu ft. For convenience, it is useful to express this "standard" air as the volume occupied by one pound of air. This is numerically equal to 13.34 cu ft per lb. The volume occupied by one pound of dry air is referred to as the specific volume, and this volume increases with altitude.

Associated with any pound of dry air is a varying amount of water vapor. The amount of this water vapor which can be associated with the pound of dry air will vary from zero to a maximum which is established by the particular atmospheric pressure and the temperature of the air at that pressure. If the temperature of the air is fixed, the maximum amount of water vapor associated with the pound of air is established by pressure (altitude for free air). At any given temperature, the amount of water vapor which can be associated with a pound of free, dry air increases with altitude.

The effect of altitude must be considered when applying several different types of equipment and in the design of duct systems. To illustrate, consider some rather typical situations.

Registers and Grilles

A room in a building with elevation 5,974 ft (24 inches Hg) above sea level has a heat loss of 10,000 Btu per hr under design conditions of 0 to 70F. It is estimated that the temperature of the supply air will be 140F. If it is desired to know the weight of air at this temperature which will supply this amount of heat and, to introduce this air into the heated space at a velocity of 800 ft per min at the outlets, how shall the register or grille be selected from the manufacturer's catalog?

The weight of air per minute G, required to deliver this amount of heat will be,

$$G = \frac{H}{60} \times \frac{1}{\text{sp.ht}} \times \frac{1}{(T_2 - T_1)}$$

$$G = \frac{10{,}000}{60} \times \frac{1}{0.24} \times \frac{1}{(140 - 70)} = 9.92 \text{ lb per min}$$

where, 60 = minutes per hr, and 0.24 = specific heat of air, Btu per lb (F)

Enter the chart, Fig. 1, on the abscissa at 140F and move vertically to the 24-inch Hg barometer curve and read on the ordinate the value of specific volume to be 18.8 cu ft per lb of dry air. The outlet, therefore, must deliver,

$$Q = 9.92 \times 18.8 = 186 \text{ cfm}$$

The static pressure behind the grille which is required to deliver the air at a velocity of 800 ft per min can be readily arrived at. Remember that very nearly

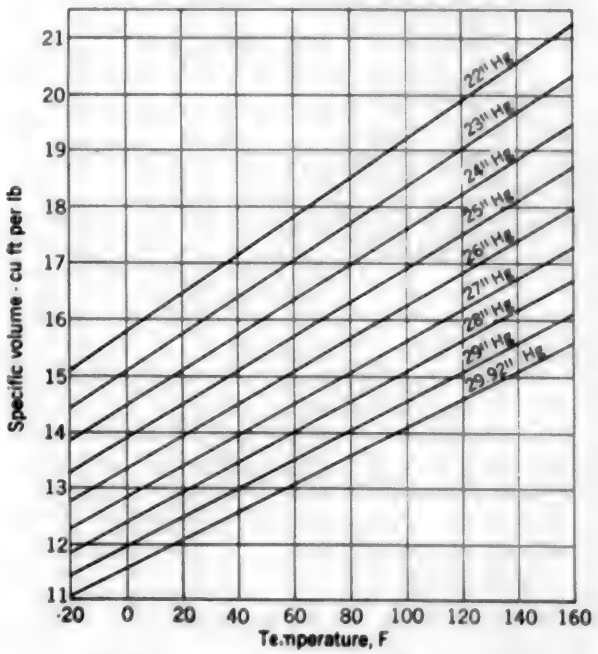

Fig. 1. Specific volume of dry air at various temperatures and pressures.

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TABLE 1—RELATION OF PRESSURE TO ALTITUDE

Pressure, Inches Hg	Altitude, Feet
20	10,726
22	8,262
24	5,974
26	3,814
28	1,824
29.92	0

$$h_v = \left(\frac{V}{1096}\right)^2 \frac{1}{V_d} \quad \text{where,}$$

h_v = velocity head of the air in inches of water
V = velocity of the air in ft per min
V_d = specific volume of the air in cu ft per lb.

Substituting the values of the example,

$$h_v = \left(\frac{800}{1096}\right)^2 \times \frac{1}{18.8}$$

$$= 0.028\text{-inch water gage}$$

Practically, h_v, can be considered equal to the static pressure required at the grille face. For convenience in this matter, see Fig. 2.

From the manufacturer's catalog select a grille which will, most nearly, permit the delivery of 186 cfm with a face velocity of 800 ft per min. Note the static pressure listed or interpolated for this delivery. Correct the static pressure thus arrived at as follows:

$$SP_e = SP_s \times \frac{\text{specific volume of standard air}}{\text{specific volume of design air}}$$

$$= SP_s \times 13.34/18.8 = SP_s \times 0.71, \text{ where,}$$

SP_e = static pressure at design altitude
SP_s = static pressure at sea level

As a check, compare the value thus obtained with the value of h_v obtained by the use of Fig. 2. The two values should be in reasonably close agreement (on the order of 10 per cent deviation).

Ducts and Blowers

Duct design can be accomplished with the standard air friction chart in the following manner:

1. Estimate the amount of pressure loss which can be allocated to the duct system and express this loss in terms of inches of water per 100 ft of duct length.
2. Correct this pressure drop allowance per 100 ft of length to standard air conditions; for example,

$$P_s = P_d \times \frac{\text{specific volume of design air}}{\text{specific volume of standard air}}$$

Using the conditions of the previous example.

where: $P_s = P_d \times 18.8/13.34$

P_s = Pressure drop in inches of water per 100 ft of duct to be used with the standard friction chart
P_d = Pressure drop per 100 ft of duct under the design conditions.

As a specific example, assume air at 24 inches barometer and 140F to be flowing in a duct system in which a pressure drop of 0.12-inch of water has been established as the maximum loss per 100 ft of length that can be allowed.

The friction loss per 100 feet which should be used with the standard friction chart will be:

$$P_s = 0.12 \times 18.8/13.34$$
$$= 0.17 \text{ inches of water per 100 ft of duct}$$

To summarize the case, for a duct friction loss of 0.12 inch of water per 100 ft of duct carrying air at 140F, and at an elevation of 6,000 ft above sea level, use a standard air friction chart at a value of 0.17 inch of water for the purpose of duct sizing.

Next to be considered is the matter of blower selection.

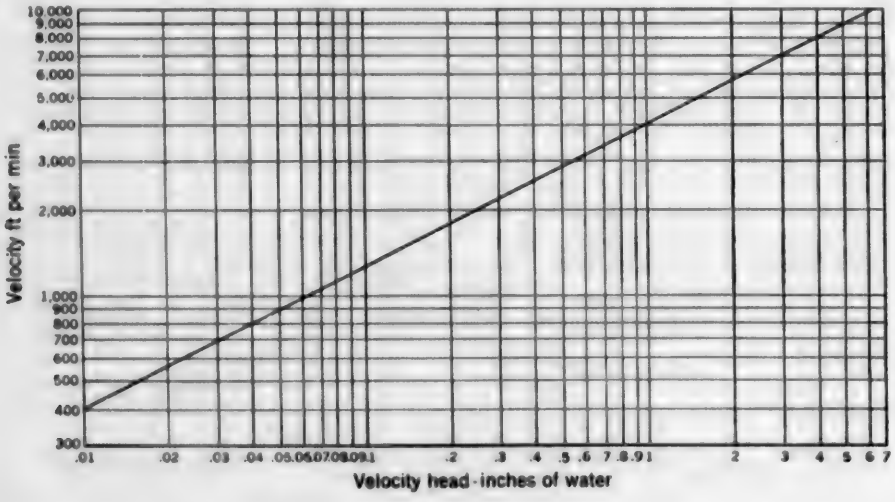


Fig. 2. Velocity versus velocity head for standard air.

A blower is essentially a constant volume device when operated at a given speed. Hence, since blower selection tables are based on the delivery of standard air, it is necessary to make certain corrections to permit the delivery of a given weight of air at other than standard conditions.

Assume our requirements are for the delivery of 992 lb per min of air at 52F to be delivered to a bank of coils. The altitude of the installation is 6,000 ft above sea level and the resistance against which the blower must operate is 1.25 inches of water.

From Table 1, it is found that at an altitude of 6,000 ft corresponds to a barometric pressure of 24 inches Hg.

1. Enter Fig. 1, at 52F to the diagonal line for 24 inches Hg and move left to find the specific volume of the air to be handled by the blower to be 16.1 cu ft per lb.
2. The required volume of air per minute will be:
   $992 \times 16.1 = 16{,}000$ cfm
3. If a blower were delivering this volume of air into this system at sea level, the resistance against which it would work would be:
   SP = 1.25 x 16.1/13.34 = 1.55 inches of water
4. From the manufacturer's catalog select a blower which will deliver 16,000 cfm against 1.55 inches of water. Note RPM, SP, and HP.
5. RPM will require no change; static pressure at design condition will be listed static pressure x 13.34/16.1; horsepower at design condition will be listed horsepower x 13.34/16.1.

Heating Coils

Before making a typical heating coil selection from a manufacturer's rating table, consider some of the factors involved. The manufacturer's rating tables are usually arranged to show the heat transfer of several coil styles with steam being supplied at several gage pressures and with several quantities of air flowing over the coils. This air flow is expressed as face velocity per square foot of coil face and is in feet per minute corrected to 70F. The listed gage steam pressures are for steam at sea level.

For a given gage pressure, the temperature of the steam decreases as the altitude of the system increases, and, similarly, for a given face velocity, the weight of air flowing over the coil decreases. Therefore, for a given heat output, a coil which is to be operated at higher altitudes must be operated with the same weight of air flowing and with greater temperature rise. The variable must be, principally, the amount of heat transfer surface. The problem is how to select a coil from the manufacturer's rating tables which will satisfy the requirements of high altitude design conditions. Selection procedure will be illustrated by means of the following example in which given conditions are:

> 18,800 cfm of air at 140F and 24 inches Hg barometric pressure required by the heating system; entering air mixture to the coil at 50F; steam to coil at 15 psi gage.

What is required is:

1. Select coil.
2. Face velocity of air at discharge condition.
3. Static pressure drop of air through coil.
4. Pounds of condensate per hour.

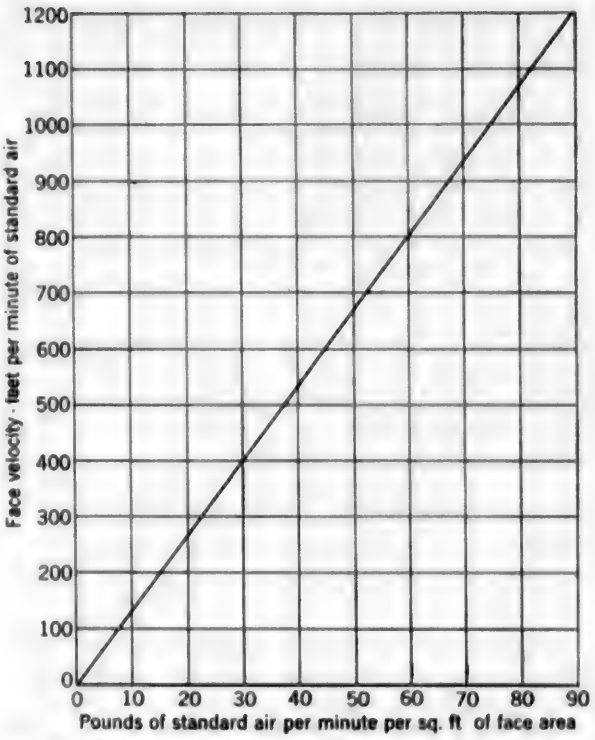


Fig. 3. Relation of face velocity and weight of air flowing per square foot of face area.

Solution:

1. From Fig. 1, find the specific volume of leaving air to be 18.8 cu ft per lb of air.

Weight of air flowing = 18,800/18.8 = 1,000 lb per min.

2. Absolute pressure and temperature of steam at design altitude:
   $14.7 \times 24/29.92 + 15 = 26.8$ lb per sq in
   From the steam table,
   T = 244.12F (use 244F)
3. Absolute pressure and temperature of steam at sea level:
   $14.7 + 15 = 29.7$ lb per sq in.
   From steam table,
   T = 249.76F (use 250F)
4. Average temperature of air in passing through coil:
   $(140 + 50)/2 = 95$F
   Average temperature difference between air and steam: At sea level: 250 — 95 = 155F; at design altitude: 244 — 95 = 149F
5. Ratio of temperature heads:
   155/149 = 1.04
6. Temperature rise at sea level for selection purposes:
   a. $\triangle t = (140—50)\ (1.04) = 93.6$F
   b. Leaving air temperature at sea level
   = 50 + 93.6 = 143.6F
7. Go to the manufacturer's table and select a coil which when supplied steam at 15 psi gage, will raise the temperature of the incoming air from 50F to 143.6F.

Note the number of rows, face velocity, and pounds of condensate per sq ft of face per hour.

8. To illustrate: From one manufacturer's catalog we select a 2-row coil which operates at 15 lb steam. Face velocity is interpolated at 493 ft per min.

By interpolation we find 52.84 lb condensate per square foot face area.

Correcting for design altitude:

52.84/1.04 = 50.8 lb cond. per sq ft face area

9. From Fig. 3 in text,
493 ft/min = 37.3 lb air per min per sq ft face area.
10. Face area required:
1000/37.3 = 26.8 sq ft
11. Face velocity at design condition for purpose of pressure drop determination:
From Fig. 1, specific volume of air at 70F, 24 inches H_g = 16.33
Face velocity = 16.33 x 37.3 = 609 ft per min.
For later convenience:
Face velocity at coil discharge = 18.8 x 37.3 = 701 ft per min.
12. To determine friction loss:
From manufacturer's catalog for the coil selected passing standard air at 609 ft per min,
(1) Friction loss = 0.157 inch of water
(2) Corrected for altitude, this becomes,
0.157 x 24/29.92 = 0.126 inch
13. Check: Heat lost by steam = Heat gained by air
a. 50.8 lb condensate per sq ft face area per hour x 949 Btu per lb condensate x 26.8 sq ft of face area = 1,292,000 Btu per hr
b. 1,000 lb of air per min x 60 min per hr x 0.24 Btu per (lb) (F) of air x (140—50F) = 1,296,000 Btu per hr

This degree of agreement is satisfactory.

Cooling and Dehumidifying Coils

Selection of cooling and dehumidifying coils to satisfy a performance required at altitudes significantly above sea level is somewhat more complicated than is the case for heating coils.

There is considerable variation in the selection techniques of the various manufacturers. Moreover, the basic heat transfer coefficients and surface area are rarely, if ever, given in the usual catalog. This lack of information requires a manipulation of formulas in such a manner as to cancel out these unknowns.

Tuve and Seigel give the following equations which are recommended for use in determining coil characteristics.

1. $$\frac{f_o AN}{0.243G} = \ln\left(\frac{t_1-dp_1}{t_2-dp_2}\right) = \ln\left(\frac{t_1-t_s}{t_2-t_s}\right)$$

2. $$f_o = ZG^n$$

3. $$f_o = \frac{q_t}{\frac{AN\,(t_s-t_r)}{R}}$$

where

A = External area of coil, sq ft/sq ft of face area = $\frac{\text{(sq ft surface)}}{\text{(sq ft face) (row of coil)}}$

N = Number of rows of coil depth

G = Weight of air flowing, lbs per hr (sq ft face)

ln — logarithm

t_1 = Dry bulb temperature, entering air, F

dp_1 = Dew point temperature, entering air, F

t_2 = Dry bulb temperature of leaving air, F

dp_2 = Dew point temperature of leaving air, F

t_s = Apparatus dew point, F

f_o = External film coefficient, Btu per hr (sq ft of surface) (F mean temperature difference)

f_i = Internal film coefficient, Btu/hr/ft/F mean temperature difference

Z = A constant

n = A constant

R = Ratio of external surface area to internal tube area

q_t = Total heat transfererd, Btu/hr/ft of face area

t_r = Refrigerant temperature, °F

If a coil, which is operating at an elevation corresponding to a barometer of *B* inches of mercury and with a refrigerant temperature, t_r, and extracting heat from air supplied at a certain condition of dry and wet bulb temperatures, and with a given weight of air per hour, *G*, passing over each square foot of coil face area were to be placed into operation at sea level with the same refrigerant temperature, t_r, the same weight of air, *G*, with the same dry and wet bulb temperatures passing over the coil each hour, then the following information can be derived.

1. Since G, is constant and f_o is constant for any altitude and any given coil,
$f_oAN/0.243\ G$ = a constant, K, therefore,
$\ln[(t_1-dp_1)/(t_2-dp_2)] = K$ consequently,
$(t_1-dp_1)/(t_2-dp_2) = (t'_1-dp'_1)/(t'_2-dp'_2)$
where prime marks indicate sea level values.
2. For design conditions
$f_oAN/0.243\ G = \ln[(t_1-dp_1)/(t_2-dp_2)]$
for sea level condition
$f_oAN/0.243\ G = \ln[(t'_1-dp'_1)/(t'_2-dp'_2)]$
because $f_oAN/0.243\ G = K$,
$(t_1-dp_1)/(t_2-dp_2 = (t'_1-dp'_1)/t'_2-dp'_2)$
From the design conditions and from the psychrometric chart t_1, t_2, dp_1, dp_2, and t'_1, dp'_1, t'_2 are known or can be derived; therefore,
$t'_2-dp'_2) = (t'_1-dp'_1)/(t_1-dp_1)$ x (t_2-dp_2)

Procedure to follow:

1. Draw a saturation curve on the psychrometric chart representing air at the design altitude. (See Tables 2—5.)
2. Plot points representing the entering and leaving design air conditions through the coil.
3. Connect the two points by a straight line extended to the constructed saturation curve.
4. At the intersection point, read apparatus dew point temperature, t_s.
5. Since t_r and f_o are unchanged, t_s is unchanged. Locate, t_s on the saturation curve of the standard (sea level) psychrometric chart. Connect this point with the point representing the condition of the entering air as plotted on the standard chart (same DB and WB temperatures).
6. At the intersection of the line drawn in step 5, with a dry bulb temperature which is the sum of the apparatus dew point temperature, t_s, and the tem-

TABLE 2—PROPERTIES OF MOIST AIR—22 INCHES Hg BAROMETER

Specific Humidity		Volume		Humid Specific Heat	Btu per lb Enthalpy		Temp, F
Pounds	Grains	Dry Air Cu Ft	Increase of Humid Air, %		Vapor	Air-Vapor Mixture	
.001	7.0	15.59	0.16	.2405	1.06	−.14	−5
.002	14.0	16.10	0.32	.2409	2.06	4.50	10
.004	28.0	16.65	0.65	.2418	4.30	10.50	26
.006	42.0	16.98	0.97	.2427	6.50	15.00	36
.008	56.0	17.23	1.28	.2436	8.65	18.97	43
.010	70.0	17.44	1.61	.2445	10.88	22.64	49
.012	84.0	17.6	1.94	.2455	13.1	26.1	54
.014	98.0	17.75	2.34	.2466	15.8	30.0	59
.016	112.0	17.87	2.60	.2473	17.7	32.5	62
.018	126.0	17.99	2.91	.2480	19.8	35.3	65
.020	140.0	18.00	3.23	.2490	22.0	38.3	68
.022	154.0	18.18	3.55	.2500	24.0	41.0	71
.024	168.0	18.25	3.86	.2508	26.3	43.8	73
.026	182.0	18.34	4.18	.2517	28.5	46.7	75

TABLE 3—PROPERTIES OF MOIST AIR—24 INCHES Hg BAROMETER

Specific Humidity		Volume		Humid Specific Heat	Btu per lb Enthalpy		Temp, F
Pounds	Grains	Dry Air Cu Ft	Increase of Humid Air, %		Vapor	Air-Vapor Mixture	
.002	14.0	14.80	0.31	.2409	2.1	4.90	12
.004	28.0	15.33	0.64	.2418	4.3	11.01	28
.006	42.0	15.64	0.96	.2427	6.5	15.59	38
.008	56.0	15.88	1.31	.2437	8.6	19.45	46
.010	70.0	16.05	1.60	.2445	10.9	22.5	51
.012	84.0	16.22	1.93	.2455	13.6	27.3	57
.014	98.0	16.35	2.28	.2464	15.3	29.9	61
.016	112.0	16.46	2.57	.2472	17.4	32.8	64
.018	126.0	16.57	2.90	.2484	19.8	36.0	69
.020	140.0	16.67	3.22	.2491	22.0	38.9	71
.022	154.0	16.74	3.53	.2499	24.0	41.5	73
.024	168.0	16.81	3.84	.2508	25.2	44.4	77
.026	182.0	16.90	4.16	.2518	28.5	47.0	78

TABLE 4—PROPERTIES OF MOIST AIR—25 INCHES Hg BAROMETER

Specific Humidity		Volume		Humid Specific Heat	Btu per lb Enthalpy		Temp, F
Pounds	Grains	Dry Air Cu Ft	Increase of Humid Air, %		Vapor	Air-Vapor Mixture	
.003	21.0	14.54	0.48	.2413	3.2	8.5	23
.004	28.0	14.74	0.64	.2418	4.2	11.3	29
.006	42.0	14.95	0.96	.2427	6.5	15.9	39
.008	56.0	15.29	1.32	.2437	8.9	20.2	47
.010	70.0	15.46	1.60	.2445	10.9	23.5	53
.012	84.0	15.60	1.93	.2454	13.0	26.9	57
.014	98.0	15.70	2.25	.2465	15.3	30.0	62
.016	112.0	15.84	2.58	.2473	17.5	33.2	66
.018	126.0	15.94	2.89	.2481	19.7	36.1	69
.020	140.0	16.03	3.21	.2490	21.9	39.0	72
.022	154.0	16.11	3.75	.2500	24.0	42.0	75
.024	168.0	16.19	3.88	.2508	26.5	44.9	77
.026	182.0	16.25	4.16	.2517	28.5	47.5	79

TABLE 5—PROPERTIES OF MOIST AIR—26 INCHES Hg BAROMETER

Specific Humidity		Volume		Humid Specific Heat	Btu per lb Enthalpy		Temp, F
Pounds	Grains	Dry Air Cu Ft	Increase of Humid Air, %		Vapor	Air-Vapor Mixture	
.002	14.0	13.73	0.32	.2409	2.1	5.5	13.6
.004	28.0	14.20	0.64	.2418	4.3	11.5	30.0
.006	42.0	14.5	0.96	.2425	6.5	16.1	40.1
.008	56.0	14.72	1.30	.2436	8.7	20.5	47.4
.010	70.0	14.88	1.60	.2445	10.9	23.7	53.5
.012	84.0	15.03	1.94	.2454	13.0	27.2	58.5
.014	98.0	15.14	2.24	.2463	15.3	31.0	63.6
.016	112.0	15.26	2.60	.2472	17.5	33.4	66.3
.018	126.0	15.37	2.97	.2483	20.0	37.0	70.3
.020	140.0	15.44	3.20	.2490	22.0	38.3	72.7
.022	154.0	15.53	3.50	.2500	24.1	42.3	75.5
.024	168.0	15.6	3.84	.2507	26.3	45.0	77.8
.026	182.0	15.67	4.20	.2517	28.5	47.8	80.3

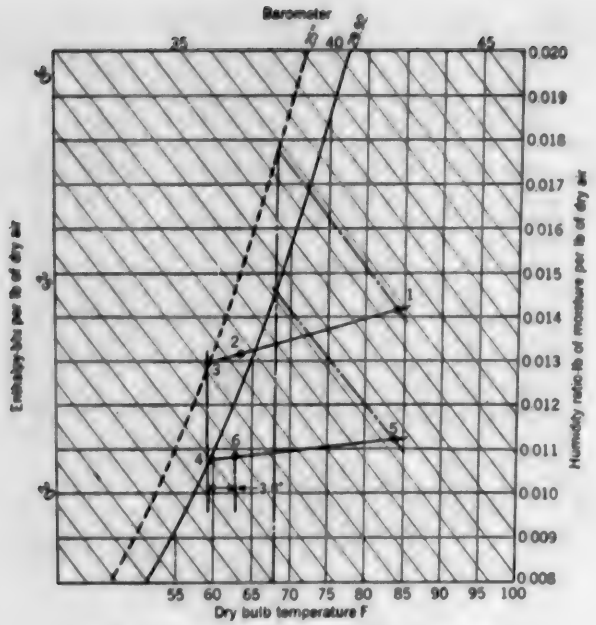


Fig. 4. Steps in the solution of a problem.

perature difference ($t'_2 - dp'_2$), as determined in the last step under cooling and dehumidifying coils locate a point which will represent the desired leaving condition of the air from the coil while operating at sea level.

7. Refer to the manufacturer's catalog and make a coil selection which will most nearly satisfy the entering and leaving air conditions as determined in (5) and (10). Note the refrigerant temperature, face velocity, leaving air condition.
8. Adjust the noted face velocity by multiplying it by the ratio of the standard barometer to the design barometer.
9. Multiply the design pounds of air flowing per minute by the specific volume of the air at design condition using the temperature of the leaving air.
10. Divide the cfm thus determined by the adjusted face velocity (determined in 8) to find the required face area of the coil.
    Note: The coil will operate with the refrigerant temperature noted in (7).

Example: Select a Freon coil to satisfy the following conditions at an altitude corresponding to 25 inches Hg barometer.

Design Conditions: Required to remove from 1,000 lb of air per minute—

5,000 Btu of sensible heat
1,000 Btu of latent heat
6,000 Btu of total heat

Air at entrance to coil
84F DB, 68F WB, 61.6F DP, $W_e = 0.01402$, $h_e = 35.62$
Where W_e = Water vapor (entering air), pounds per pound of dry air.
h_e = Total heat of entering air and moisture. Subscript *L* indicates leaving air.

Solution: Using chart with 25 inches Hg saturation curve—

(Steps, numbered in order are shown in Fig. 4)

1. Total heat reduction per pound of air 6000/1000 = 6 Btu per lb. Total heat of leaving air = 35.62—6 = 29.62 Btu per lb.
2. Temperature reduction required to absorb sensible heat 5000/0.243(1000) = 20.5F
   Leaving DB = 84—20.5 = 63.5F
3. Locate leaving air condition at point determined by intersection of 63.5F DB and 29.62 Btu per lb total heat line.
4. Connect entering and leaving condition points by a straight line extended to the saturation curve.
   Read apparatus dew point 59.2F.
5. Summarizing the desirable condition of the air as it leaves the heat transfer surface:
   63.5F DB, 61.0F WB, 59.9F DP,
   $W_L = .01315$, $h_L = 29.62$
6. Locate entering air condition (84F DB, 68F WB) on the standard chart and read
   60.3F DP, $w_e = 0.01120$, $h_e = 32.5$ Btu
7. $t_1 - dp_1 / t_2 - dp_2 = t'_1 - dp'_1 / t'_2 - dp'_2$
   $(84 - 61.6) / (63.5 - 59.9) = (84 - 60.3) / (t'_2 - dp'_2)$
   $t'_2 - dp'_2 = 3.83$F
8. On the standard chart, connect the entering air condition point with the point on the saturation point intersected by 59.2F DB.
9. Where (59.2F+3.8F = 63.0F) DB intersects the drawn line, read the leaving air condition to be
   63F DB, 60.6F WB, 59.2F DP,
   $W_L = .01073$, $h_L = 26.9$
10. Refer to the manufacturer's catalog, using the selection method recommended there, select a coil, face velocity, and refrigerant temperature which will most nearly satisfy the leaving air condition determined in step 9, when supplied with air as described in step 6.
11. Find required face area:
    a. FV of coil noted in 10, represents pounds of air per minute per square foot of face area and can be determined from Fig. 3.
    b. Total flow required = 1000 lb per min (correct, if necessary).
    c. $FA = \dfrac{\text{corrected total flow in lb/min}}{\text{lb/min/sq ft as determined in 11a}}$

Summary

The general problem of equipment application and design requirements for high altitudes is largely one of giving due consideration to the effect of ambient pressures on those items of equipment the performance of which is pressure sensitive.

For your convenience, the various figures and tables have been added. Tables 2-5 facilitate the plotting of saturation curves for several altitudes on the psychrometric chart. The numerical values contained in these tables are interpolated from material published in Air Conditioning Analysis by William Goodman.

A useful 2-color, multi-pressure psychrometric chart was prepared by G. E. McElroy of the U. S. Bureau of Mines and is described in BMRI 4165, available from the Bureau in Pittsburgh, Pa. A smaller version of the chart was published in HEATING AND VENTILATING, January, 1952.

Interior of the Blackeberg No. 2 district heating plant in Stockholm, Sweden. This is the largest such plant built in that area.

Swedish High Capacity Boilers Solve District Heating Problem

HOLGER LUNDBERGH

Since Sweden lacks coal and fuel oil and must import these items, considerable attention has been devoted to the more efficient burning of coal and oil for space heating. High capacity hot water boilers have been developed to serve district heating systems in a number of cities.

AN interesting postwar development in domestic heating has resulted in the recent completion, in a number of Swedish cities, of large district heating plants capable of providing thousands of apartments and other premises with heating and service hot water. Constituting a response to the challenge presented by the lack of coal and oil in Sweden, this system is regarded as having departed sufficiently from the common technical trends in other industrialized countries to warrant the label "Swedish method of heating."

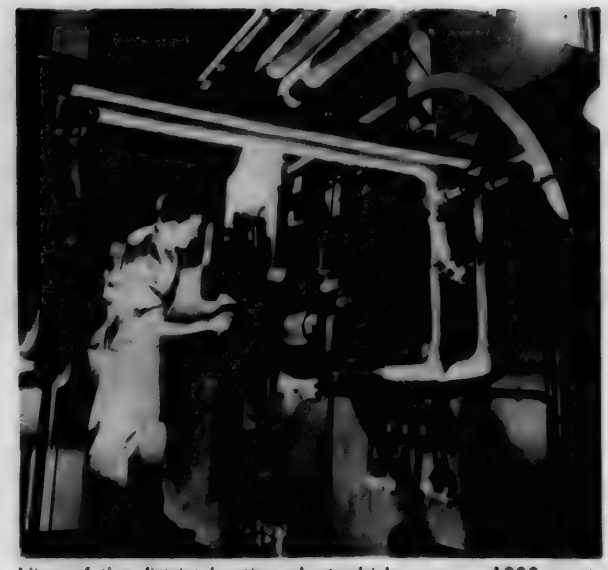
Owing to climatic conditions and the ever-increasing demand for industrial fuels, the annual import bill for fuel has put a strain on Sweden's national economy. Fuel and the economical combustion thereof quite naturally become matters of more vital interest in Sweden than perhaps in countries favored by an abundant supply of coal and oil. Swedish combustion engineers, aided and encouraged by the authorities, have for years directed their inventive talents to improving combustion plants and to the development of more efficient insulation methods and materials and installation practices. Ultimately, this national preoccupation with fuel economy has given rise to new conceptions and advanced methods, in both industrial and domestic heating.

The new Swedish domestic heating system is deceptively simple. The medium is hot water, which is circulated through room radiators in the same way as in other types of central heating, except that the temperature of water leaving the boiler is much higher, varying between 185 and 230F. It is a low-pressure system; in the boiler and mains, the pressure never exceeds 60 psi. There are, in short, no particularly fancy scientific or technical problems involved in the design of these boiler plants which, however, with officially recorded efficiencies of more than 90 per cent, has exceeded anything hitherto accomplished in the way of energy conversion.

Exhaust Fan Speeds Gases

It is all a matter of boiler design. During the war, when Sweden suffered from a continuous fuel crisis, boiler designers began to strike out in new directions. Using welded construction, the units grew in capacity, and the conventional boiler tubing was abandoned in favor of welded water chests. The boilers were provided with fans to increase the secondary air supply.

This phase of contemporary Swedish boiler design consequently produced a number of new and improved types of boilers. One of the most interesting of these is the Gustavsberg high efficiency boiler which, instead of an air fan, is provided with an exhaust fan at the rear of



View of the district heating plant which serves a 1000-apartment housing development in Stockholm.

the boiler to speed the combustion gases through a series of narrow flues between the finned water chests. This has increased the gas velocity through the boiler to 100-115 fps. In this manner, a highly efficient heat transfer is obtained between the combustion gases and the water. Since the heat transfer per unit area per hour is increased, the boiler units can be made much smaller for a given capacity. Other incidental benefits are the dust separation obtained by the exhaust fan as well as substantial reduction in the size of the stack, since no natural draft is required for boiler operation.

No Smoke Hazard

From a civic point of view, too, the Gustavsberg boiler possesses considerable interest, since it permits the operation of high capacity boiler plants in the heart of any residential district. In spite of the modest height of the smoke stack, there is no smoke hazard to cope with, even in the immediate neighborhood. If generally adopted in industrial cities, the system would involve a solution of the old smoke and dirt problem. Such a problem faces many large cities.

The new system came into full development in a couple of push-button heating plants recently completed and serving a new model residential district in the Stockholm suburb of Blackeberg. One of these plants has five boilers, each having a capacity of 11 million Btu per hour, and provides heating and hot water for some 1,550 apartments and 130 commercial premises and garages.

Automatic Operation

The plant is fully automatic and is maintained by one engineer and an assistant. Recording units provide control of all factors bearing on fuel economy. The boilers are equipped with rotary oil burners and coal-fired stokers. The fuel used depends on current market quotations. However, with the country's peculiar situation in respect to coal and oil, and the risk of once more being cut off from the fuel markets abroad, the boilers can be converted overnight to such secondary native fuel as wood and peat.

On official tests, under actual operating conditions, the maximum efficiency of the boilers, when oil-fired, was 93.5 per cent. When stoker-fired, with a rather inferior grade of coal, 89.7 per cent efficiency was recorded. The true significance of these results will be fully appreciated by engineers. When wood or coal is used in an open fireplace, only a small per cent of the heat in the fuel is utilized. Although conventional cast iron apartment house boilers would be able to give about 70 to 75 per cent fuel efficiency, they are, in most cases, so haphazardly tended as to waste considerable fuel heat.

Savings in Manpower and Fuel

Hot water leaving the boilers enters well insulated conduit mains at temperatures varying between 185 and 230F, depending on the heating requirements. The hot water is conveyed a couple of miles with an overall loss in temperature of a few degrees. In the houses, the mains terminate in heat exchangers, which turn the hot water into warm water of a temperature suitable for radiator heating and service hot water. It is estimated that the two automatic plants at Blackeberg have released some 70 full and part-time boiler tenders. Likewise, the saving in fuel is very substantial.

The postwar Swedish experiences with this particular type of low pressure district heating has sharpened the appetite for even larger systems. On the drafting boards are boiler units with a rated output of 32 million Btu and more for use with low-grade coals fed by traveling grates. There is no particular reason why in the near future entire cities could not be serviced in this manner by one or a few large heating plants. From the interest evidenced abroad, it seems likely that this future development of the "Swedish method" will be employed in several war-devastated cities that are now rising out of the ruins.

Interior of the Blackeberg No. 1 plant showing the four Gustavsberg welded steel water boilers. All photographs with this article, courtesy of The American Swedish News Exchange.

AIR CONDITIONING HEATING AND VENTILATING'S
Reference Section

Water Supply for Tall Buildings

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Water Supply for Tall Buildings

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Where buildings are too high to be served directly by street water main pressure, then pumps and roof tanks, with or without special zoning, may be necessary. This article discusses three types of systems for supplying water and presents a group of typical piping layouts for buildings ranging from four to thirty floors. Figures show the essential piping. They do not include details for controls, alarms, valves, overflows and drains which are standard and are not pertinent to the principles portrayed.

IN localities where street water mains exist, the water supply to low buildings usually presents no special or unusual problem. The available pressure in the street water mains is usually sufficient to supply the minimum required pressure to all fixtures in the building through an up-feed supply system. However, where buildings are too tall for the available pressure in the street water mains to supply all the fixtures in the building, higher pressure systems must be provided to serve upper floor fixtures that cannot be properly supplied by the available pressure in the street water main. Similarly where buildings are supplied with water from deep wells or from surface water sources, pressure systems must be provided to supply all fixtures in the building.

Water systems for supplying the fixtures in a building above the available street pressure or from deep well or surface water pumps, fall in three types as follows.

1. Overhead gravity supply tank water systems.
2. Hydro-pneumatic pressure tank water systems.
3. Direct pumping booster water systems.

The first of these, the overhead gravity supply tank system is the most commonly used, as it is the most reliable (water in the tank is always available by gravity in the event of an electrical failure), is cheaper than the hydro-pneumatic pressure tank system, requires less maintenance, costs less for pumping, usually requires fewer pressure reducing valves, and allows the domestic reserve capacity in the tank to be available for fire fighting as well as the required fire reserve in the tank.

The hydro-pneumatic pressure tank system has no advantages to justify its installation except where it is impossible or impractical to provide an overhead gravity supply tank at the required height. A hydro-pneumatic pressure tank is essentially an operating cushion to smooth out and regulate the pump operation and is not a storage tank to any degree. Figure 1 shows the tank hookup.

With an overhead gravity supply tank, the domestic water storage and the fire reserve may be combined into a single tank or tanks with all the water in the tank

always available for fire protection. With hydro-pneumatic pressure tanks, the domestic water and the fire reserve are usually kept in separate systems which means that the domestic water capacity is not available for fire protection. To provide minimum required pressures and to give a proper operating pressure control cycle for the pumps, the maximum pressures in the hydro-pneumatic pressure tank system are greater than with an overhead gravity supply tank system.

The direct pumping booster system is the least desirable of all, except where the flow is practically uniform and constant. Where, as is the usual condition, the flow varies widely and rapidly, automatic pressure operation will soon wear out the motor and controls from continual starting and stopping. Continuous operation of the pump with a bypass relief valve is costly (high electrical consumption), and so can only be justified where there is only very occasional use of the pump as for fire supply or for domestic supply where only occasional, unusual conditions create a low pressure which must be provided for over a relatively short period.

High Pressure Undesirable

As too high pressures are considered undesirable in domestic water piping systems, due to increased maintenance costs, (replacement of faucet washers), and due to an increase in water hammer conditions (pipe line noise and vibration), pressure reducing valves are usually provided where the static pressure exceeds 50 psi. Either branch pressure reducing valves or master pressure reducing valve assemblies are used with parallel valves or one valve and a bypass on mains or risers. As pressure reducing valves also mean additional maintenance, zoning is usually considered in tall buildings to limit static pressures. Similarly high static pressures are undesirable on fire standpipe systems, as it is dangerous for untrained persons to handle fire hose at high pressures. Therefore, where high static pressures on fire hose outlets are unavoidable, adjustable pressure reducers must be provided (on 2½-inch fire hose, over 55 psi, on 1½-inch fire hose over 85 psi) so as to limit flowing pressure for untrained persons, but allow full pressure for Fire Department use on their arrival.

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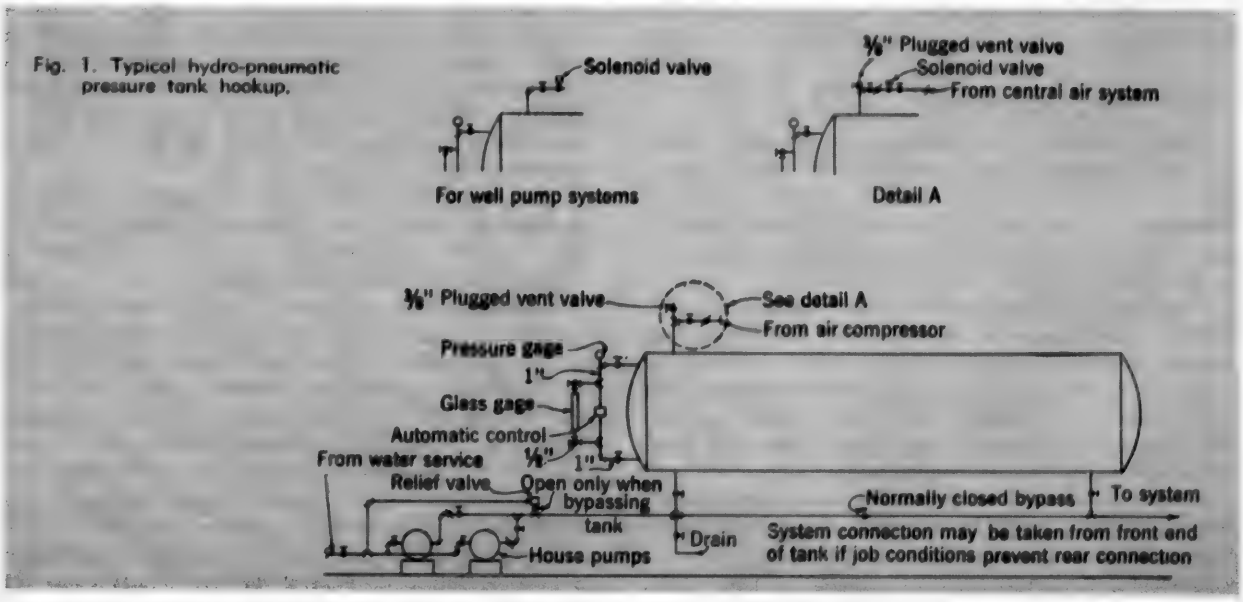
Combination System

Where an overhead gravity supply tank water system is provided, a decision must be made between supplying the entire building from this gravity supply tank system or supplying a part of the building by the tank system and a part of the building by street pressure. This is not always a simple decision to make as there are many factors involved. Some of the factors effecting this decision are the number of stories that it is possible to serve with street pressure, the type of occupancy of these lower floors, the loads on these lower floors, the symmetry of layout of the plumbing fixtures on these lower floors compared to those on the upper floors, and whether the building is compact or whether it spreads out in horizontal layout.

Where the layouts on the lower floors are similar to those on the upper floors, it is usually cheaper and more practical to extend the tank pressure system risers down to feed these lower floor fixtures. This is particularly true in the case of the hot water system where the hot water circulating lines extend down anyway and a second hot water heater assembly is a major expense, unless justified by a heavy hot water load on these lower floors. Except where the street pressure is high enough to supply

Fig. 1. Typical hydro-pneumatic pressure tank hookup.



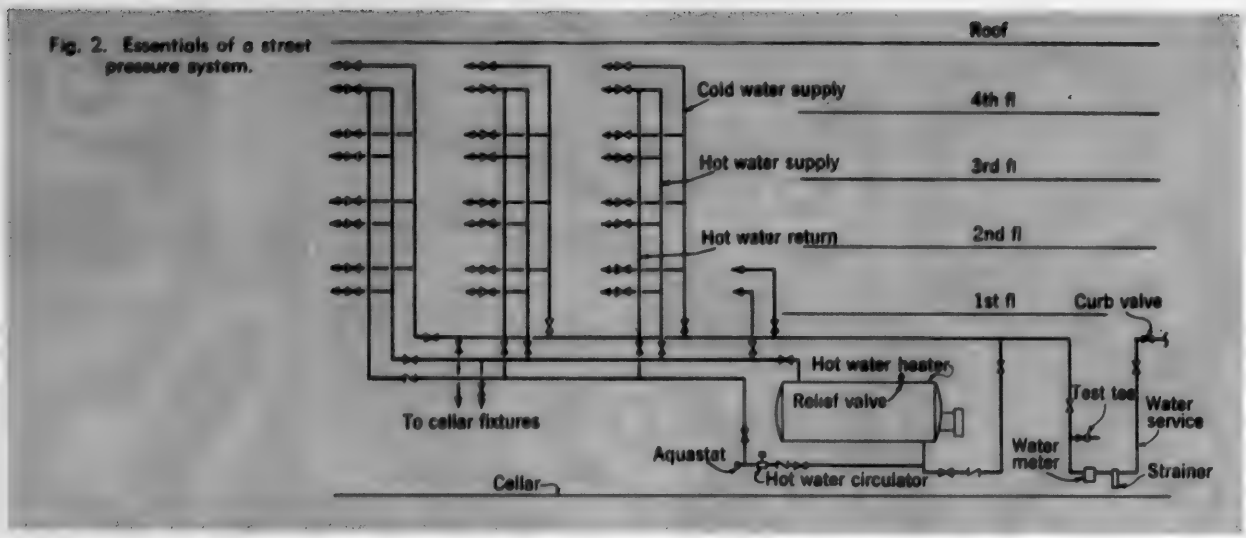


Fig. 2. Essentials of a street pressure system.

quite a few floors, it is usually cheaper and more practical to supply the whole building from a tank pressure system except for possible concentrated heavy demands in the basement. This saves the cost of additional distribution mains for the street pressure system, and in the case of the hot water system, additional circulating risers, unless the street pressure hot water system is fed with short dead end branches from the basement circulating main.

In general to sum up, use of street pressure supply systems to serve the lower floors of the building is usually justified only when heavy loads exist on these lower floors that can readily be fed from street pressure; where lower floors (first floor and basement) have radically different layouts of plumbing fixtures from the upper floors; where the building is very compact so that the run of the additional distribution piping is relatively short; or where the building is too tall for one water supply zone. Often due to light hot water loads on lower floors and the high cost of two sets of hot water heating equipment, one tank pressure hot water system will be provided for the entire building, but major cold water loads on the lower floors will be fed directly from street pressure.

Zones Keep Pressure Down

In still taller buildings, several zones are often required to keep the static water pressure at the fixtures below reasonable limits and to avoid the need for too many pressure reducing valves. For these additional zones, at least there are three possible arrangements which present themselves:

1. A single overhead gravity supply tank or tanks with a master parallel pressure reducing valve assembly feeding the lower zone.

2. Two overhead gravity supply tanks at required levels with a single pair of automatic house (tank fill) pumps feeding directly the upper tank, with the lower tank fed by a float valve from the upper tank.

3. Two overhead gravity supply tanks at required levels each served with its own pair of automatic house pumps.

Scheme 1 is cheaper in initial installation than either 2 or 3, but it has slightly higher electrical consumption than 3 as all, instead of part of the water used in the building, is pumped to the top of the building. Similarily plan 2 is cheaper in initial installation than 3, but similarily has slightly higher operating costs. Scheme 2 or 3 is required where the static pressure on the lowest fire hose station would otherwise exceed 150 psi, as this is the usual maximum allowed code pressure on a fire hose outlet.

Pump and Tank Sizing

Gravity water supply tanks and their fill pumps must be carefully sized for proper operation. There must be a proper relationship between peak demand, total demand, pump capacity, and tank size to insure a continuous supply of water to the system and a reasonable operating cycle for the pump. There are many methods used by designers in sizing tank fill pumps and gravity water supply tanks. Usually it is desired to keep this tank or tanks a minimum size, not only to save space, but also to save on structural costs for support up through the building. In this case, the number of plumbing fixtures in the building being fed from the tank system is multiplied by a factor (tables are available giving special factors for varying types and sizes of buildings), and to this is added all the continuous water demands in the building. The result gives the approximate gallons per minute rating of the required pump.

The required head on this pump is obtained by adding the vertical distance from the pump to approximately a foot over the top of the gravity supply tank, and the friction loss in the pump discharge line between the pump and the tank. From this total is subtracted the minimum available pressure at the suction of the pump. The resultant figure is the required head on the pump. Thus with the approximate gallons per minute capacity and the required head of the pump established, the pump can readily be selected from a study of pump curves. If the pump takes its suction directly from the street water main, the suction pressure will be the available street pressure (adjusted for the difference in elevation between the point of pressure reading and the pump) less an allowance for a possible future drop in street pressure, and less the

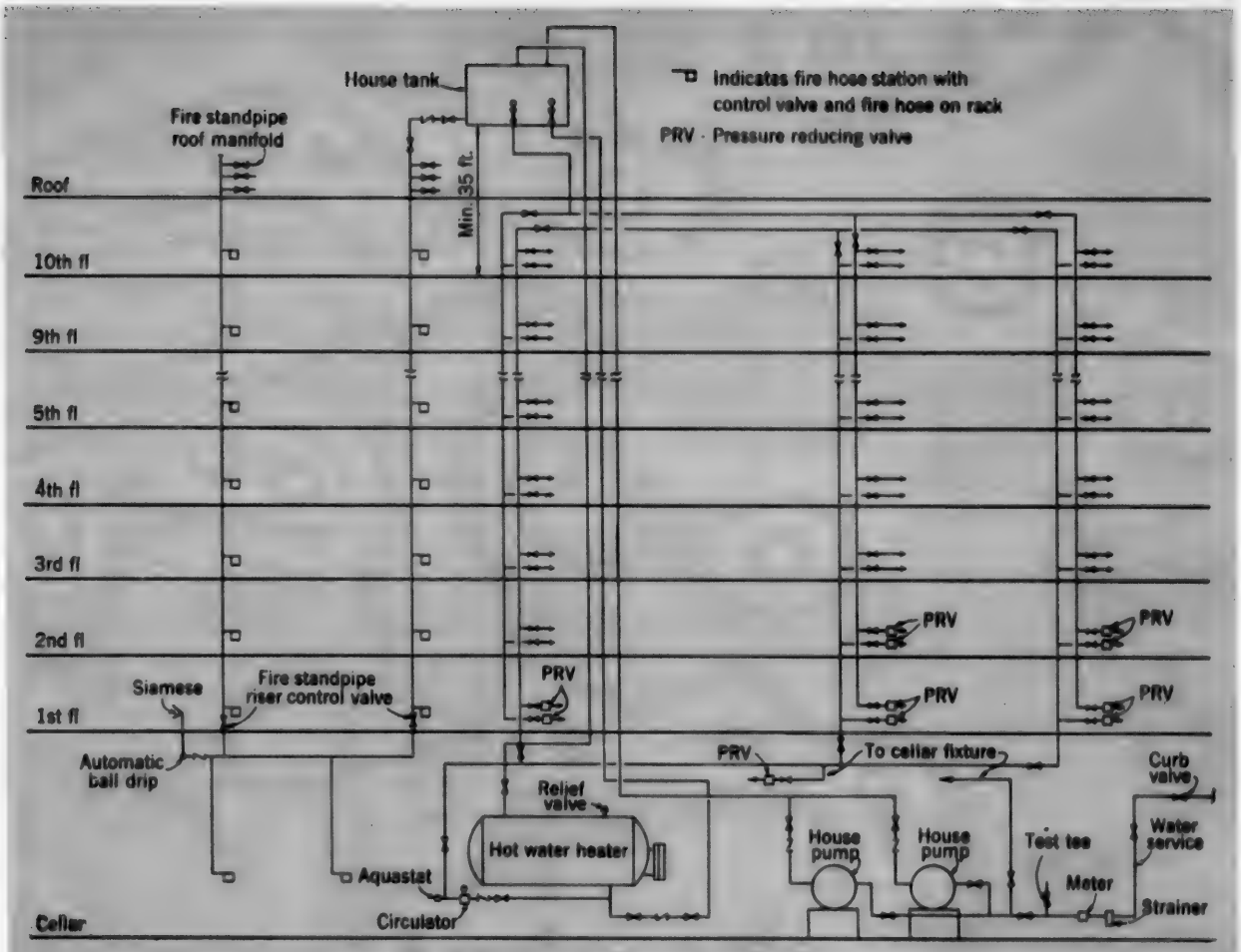


Fig. 3. One-zone gravity supply tank system.

friction loss through the service, strainer, meter, and inside piping from the service entrance point to the pump location. This friction loss should be figured on the rated gallons per minute pump capacity and the average peak water flow of the street pressure system flowing simultaneously.

If the pump is supplied from a suction tank, its suction pressure is usually assumed as zero. The tank size is then obtained by multiplying the gallons per minute capacity of the pump by a factor of approximately 30 to 40, and then adding all code requirements for fire standpipe system and/or sprinkler system reserve. Where a definite amount of storage (day, half day, etc.) is desired, the size of the gravity supply tank is established on this basis. However in this case with plenty of tank capacity to satisfy short period peak demands, the pump can be considerably smaller, for it need only replenish the tank capacity in the required time. This set-up is especially desirable (1) where the water supply is from wells as it keeps down the required size and cost (2) where the water supply is available only in small quantities or (3) its dependability is uncertain.

Pressure Tank

Pumps and hydro-pneumatic pressure tanks are sized very much similar to the previous method. However, it should be remembered that the hydro-pneumatic pressure tank is merely a cushion to properly cycle the pumps and is not a storage reservoir. If storage is required for this system, it must be provided by an additional tank on the suction side of the pump. The pressure tank, when the pump shuts off at required pressure, contains part water and part air. It is the expansion of this air between cut-out and cut-in pressures that forces the usable water out of the tank. Except in the unusual case where a large pressure differential is possible, only a relatively small quantity of water is available from the tank per cycle. Therefore, as the expanding air governs the quantity of water available for use per cycle, the controls should be set so that there is as much air as possible in the tank at pump cut-out conditions. The limiting factor in the air-water ratio is of course that there must be sufficient water left in the tank at pump cut-in to keep the outlet well submerged and prevent the entrance of air bubbles into the water system.

In figuring the pump head, in addition to required pressures, lifts and friction, the pressure differential of the pump cycle operation must be added so that the system will have the required pressure at the pump cut-in point of operation.

In well pump systems, the pump usually sends a slug of air into the tank on every cycle. As this is more air

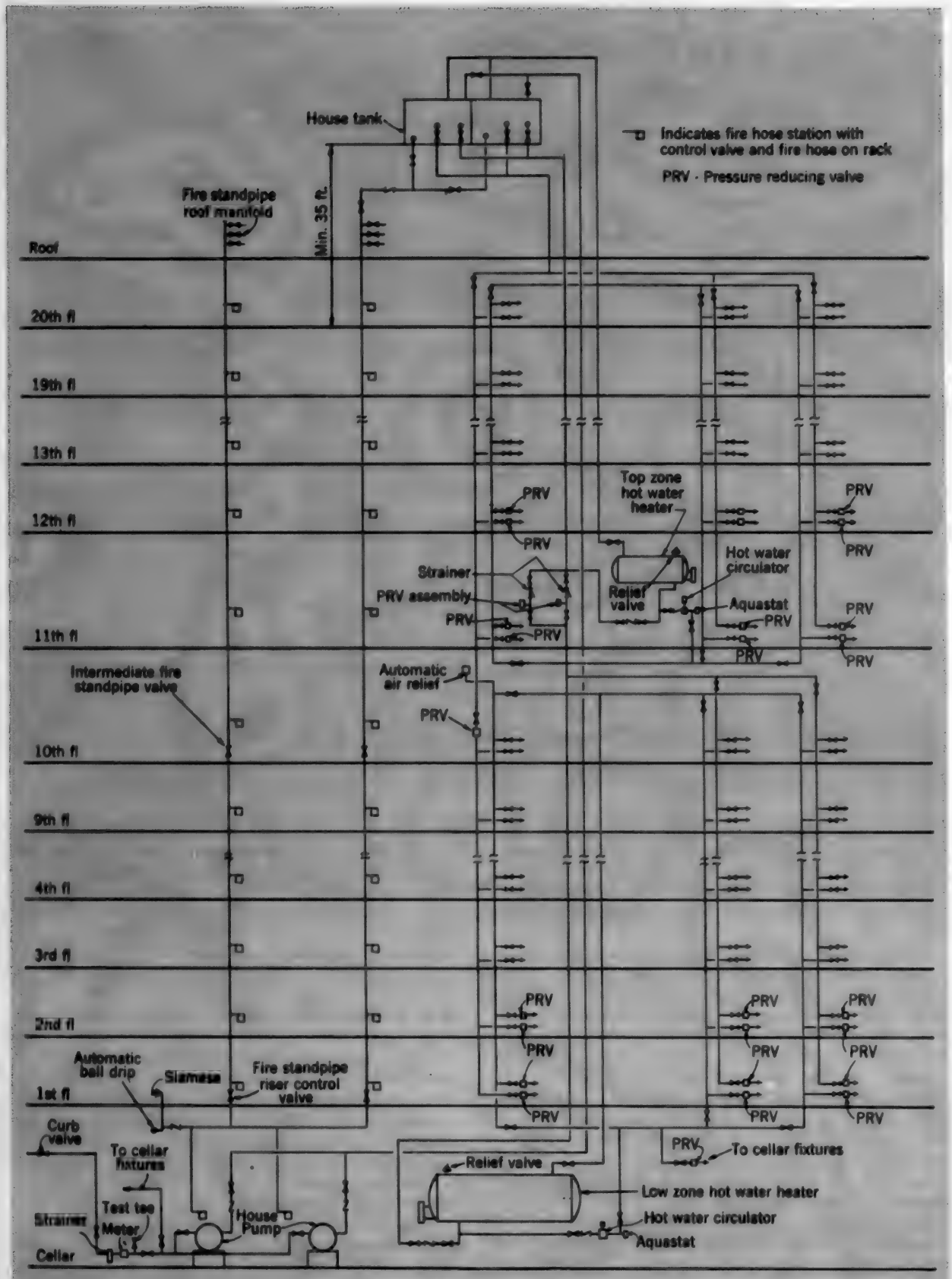


Fig. 4. Two-zone gravity supply tank system. The gravity supply systems illustrated provide water for fire hose stations and for building services.

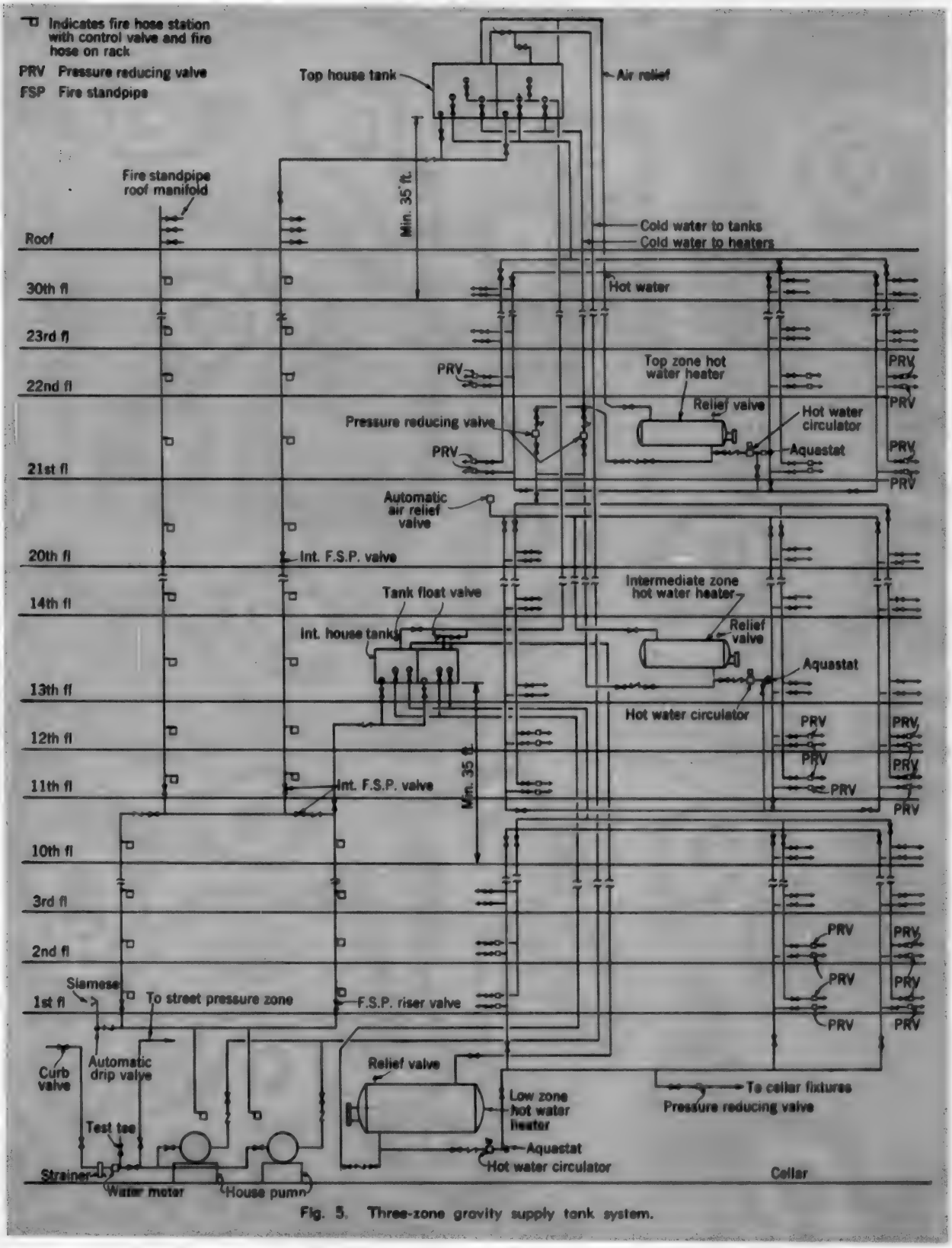


Fig. 5. Three-zone gravity supply tank system.

than can be absorbed by the surface of the water, the tank controls must test the tank for its air quantity on every cycle and exhaust the excess air through a solenoid valve. In systems using centrifugal pumps with suction from mains, no air is added in the pumping process, therefore the tank controls must test the tank for its air quantity on every cycle and add air either by opening a solenoid valve from a central building compressed air

system or by starting a separate small air compressor to make up for the air absorbed by the surface of the water. Fig. 1 shows a typical hydro-pneumatic pressure tank hook-up together with the necessary valves, bypasses and automatic controls.

Basement Storage

Tank requirements should be divided either into one double compartment tank or into two separate tanks in order to allow for continuous service during maintenance and repair.

Where the pumping rate of the house pumps would create too great a pressure disturbance in the public street main, or where considerable on-site storage is desired (storage in the basement is cheaper than on the top of the building due to savings in structural costs), a double compartment (suction, surge, or storage) tank or two separate tanks are usually provided.

In the case of direct pumping booster pumps, the gallons per minute rating must be equal to the peak demand of the system, and the head, the pressure that must be added to the available pressure to secure the required pressure.

Air conditioning cooling towers located above the overhead gravity water supply tanks must be supplied with their required water by booster pumps tanking their suction from the gravity tanks.

Where overhead gravity water supply tanks that serve pent house fire hose stations cannot be placed high enough to give required code pressure at these hose outlets, special automatic booster pumps supplying these outlets and at the same time allowing water pumped into siamese connections to reach these outlets, can often be worked out with the proper authorities.

Where isolated high pressure water requirements exist in a building, they can usually be served most readily by a booster pump providing the demand is fairly constant and consistant. However, if the demand is fluctuating and intermittant, a small hydro-pneumatic pressure tank system is the best solution.

For buildings that exceed 250 ft in height, codes usually require the installation of a fire pump with its suction either direct from the street main or from a suction tank of prescribed size, pumping directly into the fire standpipe system to supplement the high pressure supply from the mobile fire engine connected to the siamese.

Piping Diagrams

Figures 2 to 5 show a street pressure system, a one-zone gravity supply tank system, a two-zone gravity supply tank system, and a three-zone gravity supply tank system. While these sketches are intended to indicate the general features of the system, they do not attempt to include all details such as valves, drips and accessories that are required to make the system complete. For simplicity they indicate hot water circulators for all hot water systems, while actually due to the size of the system and the length of the horizontal run of the piping, most large buildings will require regular pumps for this purpose rather than in-line circulators.

The 35 ft minimum height indicated from the top floor served to the bottom of the overhead gravity water supply tank is usually sufficient for flush valve operated floor outlet siphon jet water closets on this floor unless the building has unusual horizontal magnitude which would cause undue friction loss in the distribution mains, and it satisfies most code requirements of 30 ft for fire standpipe systems. However very spread-out buildings, use of wall-hung water closets or blowout water closets, or greater local code requirements for fire standpipe systems will sometimes cause this minimum figure to be increased. Where this minimum figure cannot be obtained, tank type water closets should be used on the top floor served. Where an overhead gravity water supply tank on one building also feeds several other buildings, its height is also governed by the relative elevations of the top floors served in all buildings and by the friction loss in the runs between the buildings. In this case while the domestic requirements of all buildings served must be added together in determining the tank size, the fire standpipe requirements of the largest building only need be added.

To sum up, there are numerous ways of supplying water to tall buildings, each with its own advantages and disadvantages. It is the responsibility of the designer to carefully study the situation and select the solution that best suits the special conditions of the particular building under design. The system best suited for one building is not necessarily the best for another.

REAR HOOD FOR TANK OR TABLE

Q = air quantity required, cubic feet per minute

W = tank or table width, feet

L = tank or table length, feet

K = ventilation rate, cfm per sq. ft.

Q = W x L x K

MINIMUM VENTILATION RATES	
Cold process	75 to 100
Most predominant practice	100 to 150
Hot tanks over 180°F	150 to 200

Duct diameter to maintain velocity from 1500 to 2500 L.F.M. recommended

Slot

Tank or table top

Note: Maximum width W = 8 feet
Minimum ratio length to width L : W = 3 to 1
Maximum length of transition piece = 4 ft
Use more than one for large tanks

Slot width to maintain slot velocity between 2000 - 3000 L.F.M.

$\frac{L}{2}$ to $\frac{L}{4}$

End shields desirable

$\frac{W}{3}$ $\frac{W}{2}$

NORMAL APPLICATION

Extend over tank as far as use of tank will permit, but not less than $\frac{W}{4}$

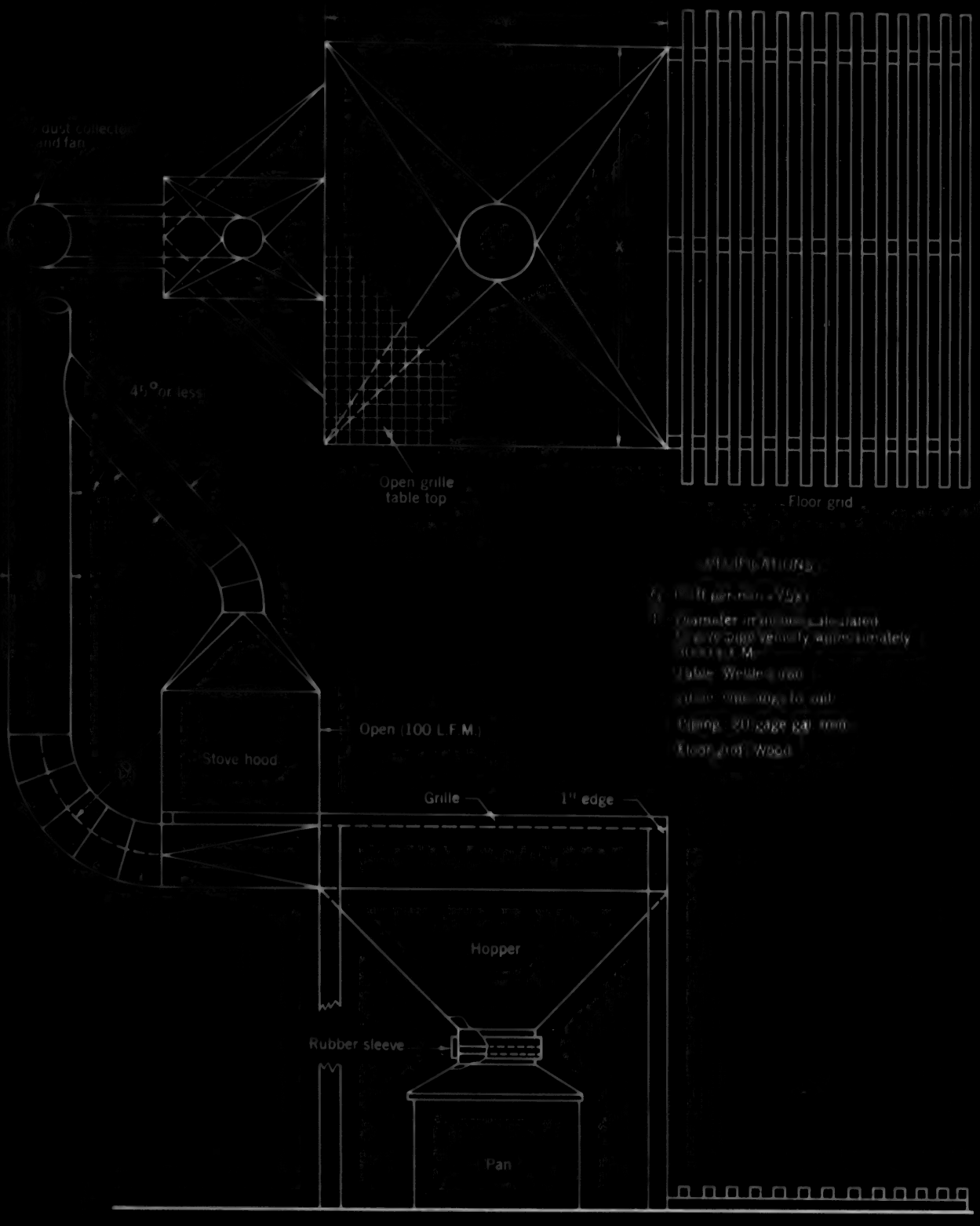
Use where tank or table cannot be obstructed overhead

Use where work is suspended above tank or table

W

CUT ALONG THIS LINE

DETAILS OF A SOLDERING BENCH



Centrifugal Pump Couplings

IGOR J. KARASSIK and ROY CARTER

Centrifugal Pump Division, Worthington Corp., Harrison, N. J.

Transmission of power from motors and engines to centrifugal pumps requires a variety of coupling arrangements according to the service requirement and power source. In this ninth of a series of articles on centrifugal pump components the authors describe the types and functions of couplings.

EXCEPT for close-coupled units, in which the impeller is mounted on an extension of the shaft of the driver, centrifugal pumps are connected to their drivers through couplings of one sort or another. Couplings can be either of the rigid or flexible type. A coupling which permits neither axial nor radial relative motion between the driving and the driven shafts is called a rigid coupling. It connects the two shafts solidly and, in effect, makes of them a single shaft. Primarily, the use of rigid couplings is restricted to vertical pumps.

On the other hand, a flexible coupling is a device which connects two shafts and which is capable of transmitting torque from the driving to the driven shaft while allowing for minor misalignment (angular, parallel or a combination of both) of the shafts. Contrary to some popular conceptions, while flexible couplings take care of such slight errors in alignment in emergencies, misalignment is undesirable and should not be tolerated permanently. Misalignment causes whipping of the shaft, added thrust on the pump and driver bearings and in general will result in excessive maintenance and potential failure of the equipment.

A flexible coupling must also permit some lateral float of the shafts, so that the two shaft ends may move closer together or farther apart under the influence of thermal expansion, hydraulic float or shifting of magnetic centers of electric motors without introducing excessive thrusts on the bearings. This specific phase of flexible coupling design will be discussed in greater detail subsequently.

Rigid Couplings

The clamp coupling (Fig. 1) is a typical rigid coupling. It consists basically of a split sleeve provided with bolts so that it can be clamped on the adjoining ends of two shafts and form a solid connection. Both axial and circular keys are commonly incorporated in the clamp coupling in order that the transmission of torque and thrust be not solely dependent upon the frictional grip.

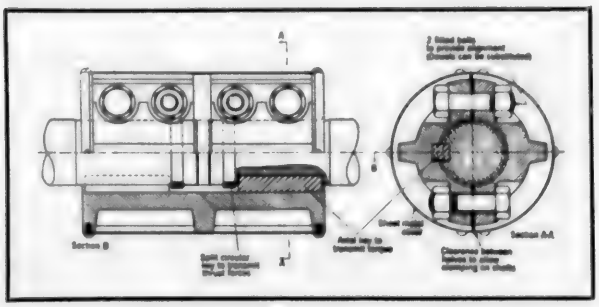


Fig. 1. Clamp coupling.

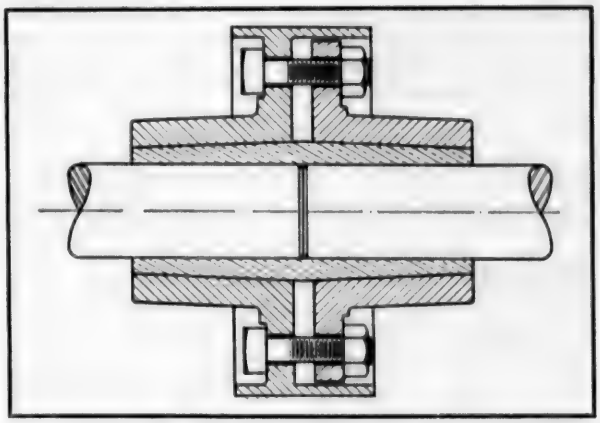


Fig. 2. Compression coupling.

A compression coupling (Fig. 2) is likewise essentially a rigid coupling. The central portion of the coupling is made up of a slotted bushing, bored to fit the two shafts and taper-machined on its outside diameter from the center out to both ends. The two coupling halves themselves are finish bored to suit this taper. When drawn together by bolting, the bushing is compressed to the two shafts and the frictional grip transmits the torque without the use of keys.

Flexible Couplings

A pin and buffer coupling is a flexible coupling having pins attached to one-half of the coupling projecting into buffers, mounted in the half of the coupling on the other shaft. (Fig. 3). The buffers are made of rubber or other compressible material, to give flexibility. The driving bolts have an easy sliding fit in the bushings and, there-

Fig. 3. (Right) Pin and buffer coupling.

fore, slight longitudinal variations are taken care of by the sliding action of the bolts within the bushings, while slight errors in angularity are compensated by the flexibility of the rubber.

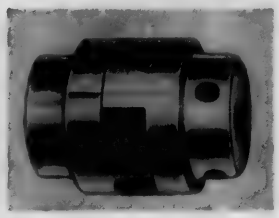


Fig. 4. (Left) Lovejoy type coupling.

The Lovejoy coupling shown in Fig. 4 is actually a modification of the pin and buffer coupling principle. It consists essentially of two flanged hubs mounted on the driving and driven shafts respectively, with lug projections or jaws in the flanges meshing with a central flexible element (generally made of rubber) which forms a spider used to absorb minor misalignments and absorb vibration.

An all metal flexible coupling is one of which all parts are made of metal. Some of these depend on the flexibility of metal plates or springs while others depend upon angular displacement possible with a spline and have two splines with a connecting splined sleeve.

The gear type "Fast" flexible coupling is illustrated in Fig. 5. In the outer shell of the coupling, inside of each end, there is a ring of internally cut gear teeth which mesh with the gears on the driving and driven halves of the coupling respectively. The torque is transmitted through the gear teeth, while the permissible sliding action and ability for slight adjustments in position is provided by a certain freedom of action between the two sets of teeth. To prevent any tendency to bind due to friction, the gears work in a constant bath of oil which is retained within the outer shell.

Another type of all-metal coupling is the Falk flexible coupling, (Fig. 6) which consists of two flanged steel hubs, a special tempered steel spring forming a complete cylindrical grid and a steel shell cover. The peripheries of the hubs are slotted to receive the spring member. The slots widen inwardly towards each other. This widening is in the form of an arc, bearing a definite relation to the thickness of the grid spring bars. The curvature is such that the points of support approach each other as the load increases. In fact, the slots are so formed that the stress on the spring members remains almost constant throughout the entire elastic range of the coupling. This coupling is grease lubricated.

The Thomas coupling shown in Fig. 7 is a non-lubricated all-metal flexible coupling made up of two hubs, mounted respectively on the driving and driven shafts and of a central flange connected to the flanges of the two hubs through a series of flexible discs. Power is transmitted in tension by the flexible discs, which are bolted alternately to the end flanges and to the center member. The flexing of the discs compensates for the misalignment.

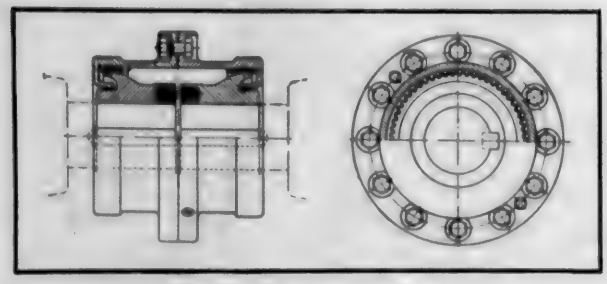


Fig. 5. Fast type coupling.

There are of course numerous other types of all-metal flexible couplings and the three types illustrated here are given as general examples.

Horizontal sleeve bearing electric motors are not generally equipped with thrust bearings but are merely provided with babbitted faces or shoulders on the line bearings. The motor rotor is allowed to float and, while it will seek the magnetic center, a rather small force can cause it to move off this center. This movement, in some cases, may be sufficient to cause the shaft collar to contact the bearing shoulders, causing heat and bearing difficulties.

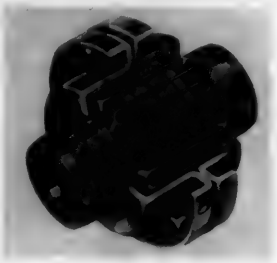


Fig. 6. (Left) Falk coupling.

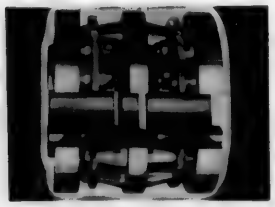


Fig. 7. (Right) Thomas type coupling

This is particularly true of large electric motors of 300 hp and higher. Since all horizontal centrifugal pumps are equipped with thrust bearings, it has become the practice to use "limited float" couplings between pumps and motors in this size range, thus keeping the motor rotor within a restricted location. The motors are built so that the total clearance between shaft collars and bearing shoulders is not less than ½ inch. In turn, the flexible couplings used in such installations are arranged to restrict the end float of the motor rotor. The restriction against closing the gap is provided either by locating a button at the end of the pump shaft, by inserting a pre-dimensioned plate between the two shaft ends or by the stiffness of the flexible discs. Contact between the hubs and the coupling covers prevents excessive movement in the opposite direction. In this manner, the total end float under operating conditions cannot exceed 3/16 inch.

Floating Shaft Couplings

Regular flexible couplings are made to connect driving and driven shafts where the ends are relatively close to each other and are suitable for limited misalignment. In some cases provision has to be made for greater misalignment. In other cases the ends of the driver and pump shaft have to be separated considerably for some reason, for ex-

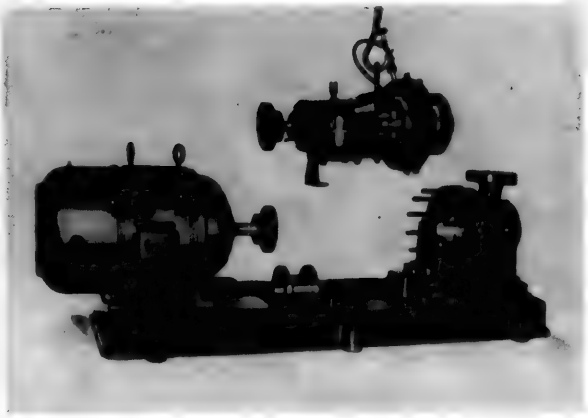


Fig. 8. Extension type coupling enables a pump to be dismantled without moving either the driver or the pump casing.

ample, in case of end-suction pump designs in which the rotor and bearing assembly is removed by drawing axially toward the driver. If neither the pump nor the driver can be readily removed, separating the driver and pump shaft ends sufficiently to allow withdrawal of the pump rotor is desirable and a readily removed flexible drive of sufficient length is necessary. (See Fig. 8.)

The extension or spacer sleeve type of coupling is commonly used on pumping units handling hot liquids where expansion may result in misalignment. Their purpose is to protect against considerable misalignment with a minimum separation of the driving and driven shaft ends. Usually this type consists of two single engagement elements connected by a sleeve. (See Figure 9.)

The floating shaft type consists of two flexible elements connected by a shaft which must be supported on each end and the flexible elements must provide for this support. Different manufacturers use different designs as required by their basic coupling designs. For instance, each of the two couplings may be of the single engagement type, may consist of a flexible half-coupling and a rigid half-coupling at each end or may be complete flexible couplings with some piloting or guiding construction.

In the smaller horsepower field (below 25 hp per 100 rpm) flexible drive shafts are commercially available. These use universal joints at each end with a tubular floating shaft and a splined portion to provide for length variation.

The floating shaft and flexible drive shaft types find considerable application with vertical dry pit pumps and specific discussion of this application will be made later when that type of pump is discussed.

Clutch Type Couplings

Regular disc-type clutches are rarely used to connect a centrifugal pump to its driver for two major reasons. The first reason is that most clutch designs impose a high additional thrust load on the pump thrust bearing while the second reason is that very accurate alignment between the clutch parts is necessary and this is difficult to maintain. The over-running clutch design has been used to connect drivers to pumps, particularly for dual driven units, and the most successful designs have a flexible coupling incorporated into the clutch unit. A clutch type coupling utilizing faced weights which are contained in the driver half and which are pressed against a drum surface on the driven half by centrifugal force, is also used.

Couplings for Dual Drive

In dual driven pump installations, it is generally desirable to have one driver idle either to save power or to save wear on the idle machine. In case of internal combustion engines, the engine could not be allowed to turn over idle and must be disconnected. The ideal type of couplings for such units are those which can be readily disengaged and engaged.

A typical example is the chain-type quick-disconnecting coupling which consists of driving and driven pinion gears butted face to face and engaged by a wrap-around drive chain which can be quickly removed by pulling a cotter pin from connected end links of the chain.

Another type of cut-out coupling is illustrated in Fig. 10. The left view shows the coupling in the connected position while the disconnected position is illustrated at the right. It is a quick and simple operation to release the location pins, slide the sleeve into or out of engagement and thereby connect or disconnect the driving unit and the pump.

Where time is of extreme importance or when the starting of the standby driver is automatically controlled, a device of the free wheeling clutch type is necessary. A coupling very suitable for this service is a clutch type coupling with spring retained shoes in the driven half of the coupling (Fig. 11). The centrifugal action on these shoes can be controlled to any predetermined speed, and no engagement of shoes takes place until after this speed is reached. Above this speed the coupling automatically picks up the load. The tension of the springs can be just sufficient to overcome the weight of the shoe or they may

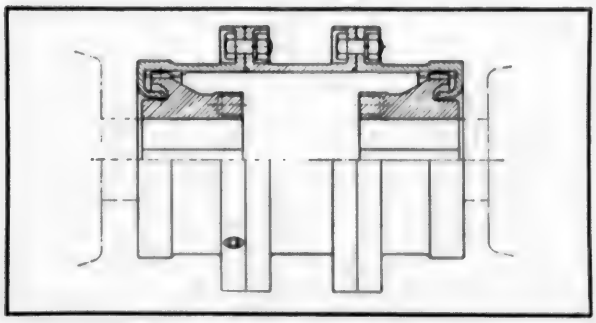


Fig. 9. Extension type coupling.

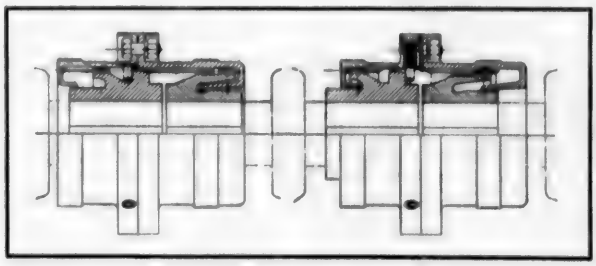


Fig. 10. Fast cut-out coupling.

be of sufficient tension to allow a pump to be driven by a motor on one side while an internal combustion engine is idling without carrying any of the load on the other side. Bringing the engine up to speed engages the coupling.

Coupling guards are stationary enclosures surrounding a coupling. Their basic function is to protect the operator from the possible danger of getting caught by the revolving coupling. They are usually made of steel mesh or steel plate and are fastened to the bedplate or to the pump foundation in the absence of a bedplate.

Magnetic Clutches and Drives

Magnetic clutches, magnetic drives and hydraulic couplings are not couplings in the strict sense of the word, as their function is to vary the speed of the driven unit rather than to provide merely a connecting device between pump and driver.

Magnetic clutches are rarely used to connect a centrifugal pump to its driver. This device requires accurate alignment and a few installations that have been made have not been very successful and have had high maintenance costs.

The only application in which a magnetic clutch could be used to advantage is the pumping into accumulator tanks or similar service where the demand varies over a wide range. It is now the practice either to start and stop the entire pumping unit or, if the cycle is too frequent for

Fig. 11. Clutch type coupling. Courtesy Centric Clutch Co.

that, allow the pump to operate at reduced capacity during the period of small demand by incorporating a bypass, so that the capacity never falls below a safe value if the demand should at times become too small for proper operation.

Both hydraulic couplings and magnetic drives are used with centrifugal pumps where variation in operating conditions warrant the use of these variable output speed devices. While they have approximately the same overall efficiency as slip ring motors with speed control, they have the advantages of easily producing any desired output speed while the regular control for slip ring motors permits adjustment of speed only by steps.

Next month, vertical dry-pit pumps.

Effect of Soils on Asbestos-Cement Pipe

Detailed information regarding the effect of soil exposure on the properties of asbestos-cement pipe has resulted from field studies recently completed by M. Romanoff and I. A. Denison of the National Bureau of Standards. Representative specimens were exposed to a wide variety of soil types for periods up to 13 years and, upon removal, the physical and mechanical properties of the pipe specimens were carefully investigated. The data thus obtained provide an over-all picture of the rate and extent of alteration of this type of pipe in the soils studied.

The exposure studies covered 4-inch and 6-inch pipe, designed to withstand a pressure of 150 psi (class 150 pipe). Both sizes of pipe were fabricated in essentially the same manner from a thin slurry of portland cement and asbestos fibers built up on a revolving steel mandrel. After removal from the mandrel, the 6-inch pipe was cured by a high-pressure steam process while the 4-inch pipe was cured by submersion in water two to three weeks.

Specimens were removed from 15 exposure sites after periods of 2, 4, 7, 9, 11 and 13 years. After removal the specimens were returned to the laboratory for determination of the effects of exposure to the soils. Representative specimens of unexposed pipe of both types were also subjected to the same tests.

In general, the data show an increase in strength during the early periods of exposure followed by a decrease in strength during the latter periods. The increased strength, which is generally accompanied by a decrease in water absorption, is associated with a curing process that continues for several years during exposure to the soil. After the completion of the curing process, the specimens were subject to weathering, as manifested by loss in strength, decrease in apparent specific gravity, increased absorption of water, and superficial softening.

The averages of the strength and water-absorption measurements indicated that the curing period was two to four years in the 6-inch pipe, as compared with approximately seven years in the 4-inch pipe. This longer curing period may be due not only to different initial curing processes but to differences in dimensions, composition, and method of fabrication. Weathering also proceeded more rapidly in the larger than in the smaller pipe.

The rate and extent of alteration of the specimens were affected considerably by the nature of the soil conditions to which they were exposed. For example, weathering was accelerated by both organic and inorganic acidity. Cement products are altered by the process of hydrolysis, and the rate of hydrolysis is increased by hydrogen ions, which are present in soils as carbonic acids. Since the decomposition of organic matter provides a large amount of carbonic acid to the ground water and so increases its activity, relatively greater losses in strength of portland cement would be expected in soils high in organic matter.

The average tensile strength of the 6-inch pipe after 13 years exposure was of the same order of magnitude as that of the unexposed pipe, and that of the 4-inch pipe was still higher. Even under the most adverse conditions to which the specimens were exposed, the bursting and crushing strengths of all the samples after exposure were higher than the requirements of the Federal Specifications for asbestos-cement pipe.

Residential Air Conditioning Discussed by ASRE

A group of papers on residential air conditioning and the various means for calculating the heat gain for such installations, was presented as part of the Air Conditioner Conference held during the ASRE convention at Philadelphia. These papers have been abstracted.

SEVEN papers dealing with residential air conditioning problems and the various means for calculating the heat gain for air conditioning systems in residences, were presented during a special conference as part of the American Society of Refrigerating Engineers convention held at Philadelphia, Pa.

Austin Village

A Progress Report on the Air Conditioned Village at Austin, Tex., was presented by Warren Scott, project director of the Investigating Committee. This air conditioned village was planned through the efforts of the National Association of Home Builders to obtain answers to questions regarding residential air conditioning. The builders group contracted with the National Warm Air Heating and Air Conditioning Association to carry out the technical investigation at this village.

In this village 22 homes were constructed by 18 builders and the cooling equipment was supplied by 22 different manufacturers. The floor area of the homes varied from 1,146 to 1,468 sq ft, with additional storage space in carport closets or attached garages. Of the 22 houses, 19 were built on floating slab foundations and 3 on piers having a crawl space area. These two types of construction represent the major home design in that area, with the floating slabs being the more popular. Both solid masonry and frame construction were used. Ceiling insulation varied in types and amount.

During the construction of the village, it was possible to embed thermocouples in the slabs and also within some of the walls.

To obtain information to analyze the air flow in the system, velocity readings were taken at each discharge and return air register. These velocity readings were obtained with both vane anemometer and a hot wire anemometer as a double check. Several readings with the hot wire anemometer were taken at different points on the register face and then averaged to determine the register velocity. The velocity of the air movement in the discharge and return air plenums was also obtained, as well as static pressure. If an outdoor air supply duct was in the system, the velocity of the air and its condition were also recorded.

In crawl space homes, the wood moisture content was measured in the wooden structural members and floor joists to assist the investigators in the study of moisture migration.

Tests were made according to conditions stipulated by the FHA. Sound level readings were obtained in each room in decibels and also a breakdown analyzing the major frequency components of this total sound.

In conjunction with the sound level meter, a vibration pick-up was used in studying the magnitude of the vibrations involved on the units and structural members of the home near the units.

The first tests were started June 17 and the investigation was completed on September 10. All of the data are now in the hands of the Field Investigation Committee of the NAWA and are at present being analyzed. A release of this data is expected soon.

Add-on Units

P. B. Beemsterboer, Frigidaire Division, General Motors Corp., presented a paper on Adding Summer Air Conditioning to Existing Homes Heated With Warm Air. It covered possible problems in connection with the installation of add-on units in residential air conditioning. The existing home market, of some 45,000,000 homes with 12,000,000 of them already equipped with some type of duct work, offers the manufacturer a ready-made market for the increasingly popular add-on central system.

In general, installation can be divided into groups as electrical, plumbing, duct work, and general. It is the last classification that can be the source of many problems. While the application of a little horse-sense will help solve many of the problems, a few of the troublesome points are listed.

1. *Are the entrances such that the equipment can be delivered?* Many times a sale is made, and at the time of delivery, the stairway or other entrances are too small to accommodate a unit. Costly alterations may be necessary.

2. *Where should the unit be placed to minimize ductwork?* If a study is not made, it is possible to find out later that labor and materials could have been saved by a better choice of unit location.

3. *Is the furnace fan adequate to handle the cooling load?* Furnace fans and motors can be utilized for cooling air delivery only if they have adequate air capacity and sufficient horsepower to overcome the added resistance of the cooling system. If a change is required later, it will cause dissatisfaction and added cost.

4. *Will the unit be touching the furnace and will vibration be transferred?* It might be possible for a noise problem to be eliminated if provisions are provided when placing a unit next to a furnace to prevent vibration transfer.

5. *Are breaker strips necessary in the supply and return ducts?* This ties in with the previous question. These are very important in some installations to prevent unit noise and vibration from being carried to the conditioned area.

6. *Should the unit be placed upstream or downstream from the furnace?* Codes in many cases dictate the proper practice. When downstream, there is a possibility of con-

densate forming on the combination chamber causing rusting. Whether or not this is harmful is debatable, but it is a problem.

7. *Should the pilot light be left burning during the cooling season in a gas furnace?* Here is another problem that may be the source of some discussion.

8. *What about gravity installations?* It seems that the addition of a blower to a gravity system was successful in many cases, and therefore, it can be assumed that using these same ducts for cooling will be successful. Caution should be exercised, in old homes, to be sure that the system is clean.

9. *What about the upstairs? Is it difficult to cool?* Naturally, since warm air rises, the tendency of heating men was to restrict the piping to the second floor. However, practice indicates that satisfactory cooling can be accomplished by cutting down on some first floor supplies.

10. *Are floor registers satisfactory—central floor returns?* Are they acceptable? Tests have shown that if the required air is delivered to a room, it will do a cooling job, but it must be remembered that the air must be deflected upward in cooling. Central returns have been successful, but here again a study of the situation must be made in order to assure a smooth path of return to the opening.

Chart Method

R. A. Gonzalez, engineer, Airtemp Division, Chrysler Corp., spoke on a chart method for residential air conditioning.

Most of the approaches to the problem of equipment selection for the cooling of residences has been in two steps as follows:

1. Making the estimate of heat gain of the residence.
2. Using this Btu per hr figure, in conjunction with equipment selection tables, to select the proper equipment.

This method results in too great a degree of refinement. Why worry about a fractional part of a ton, when the final selection will be between a 2 or 3 hp unit.

The problem of securing simplicity can be solved by expressing equipment capacity in terms of the square feet of the floor area size house that it will condition, assuming certain different house constructions and location factors. By this approach, it is possible to include the effect of wet bulb considerations on both the load and the equipment capacity. The charts resolve themselves into a reasonable series of tables. A set of tables is available for one-story houses which permits differentiation of the following conditions: Uninsulated and insulated walls, single and double glass, inside and outside shading of the sun glass.

With the charts, it is possible to enter the proper chart for a specific geographical location and for a specific house and get an answer regarding the horsepower of the cooling equipment to use, or a clear idea of the improvement in construction factors required to get within the capacity of the desired equipment.

Residential Load Calculations

Several papers were presented as a panel on the various methods for calculating the residential cooling load. They described several methods for arriving at the size of system required.

The Carrier 24-hour method was described by Burton Faigen of Carrier Corp. This method is based on two facts: (1) the outside temperature in any locality varies daily through a definite and predictable range; (2) a residence, because of the mass and its contents, has the ability to dampen this variation of outside temperature considerably.

This method of calculation has been in use for five years and over 10,000 installations have been made based on this method of calculation.

For example in Syracuse, N. Y., on a design day, the daily temperature variation is say 25F. Tests conducted on a number of residences during a period of the year when they could be normally occupied but unheated and uncooled, showed that the mass of the structure and contents of a house was capable of dampening this variation to about 6F. In other words, the maximum daily variation of inside temperature was no more than 6F.

The variation of inside temperature also was very gradual. The low point occurred about 5 or 6 a.m., very near the same time that the outside temperature reached its low point. The high point inside was reached several hours after the outside temperature reached its high point —anywhere from 6 to 10 p.m., depending upon the type of structure. The heavier the structure, the later the inside peak.

The mean temperature level inside the house at which this variation occurred was higher than the mean temperature level outside. It followed that if this was true for an unheated and uncooled house, the same variation could be held on an air conditioned house by applying refrigeration at a constant rate over the 24-hour period, equal in amount to the 24-hour heat gain which could be calculated for a lower mean temperature level inside.

Heat Storage Method

The General Electric method of estimating residential heat gain was described by C. M. toeLaer, Manager, Commercial Engineering, Air Conditioning Division, General Electric Company. It duplicates in principle the methods of the National Warm Air Heating and Air Conditioning Association and the Air-conditioning and Refrigeration Institute.

Conduction load is estimated by multiplying together an area and a suitable heat gain factor. This factor takes into account the design temperature difference, the higher surface temperature of outside walls exposed to direct and diffuse radiation, averaging the effects of orientation on radiation correction, time delay and attenuation of heat flow into the house through different surfaces.

The G.E. method provides heat gain factors for floors over vented or open crawl spaces. This floor load can be reduced about 1/3 by enclosing the crawl space and covering the ground with a vapor barrier. Further reduction can be made from the load by insulating the crawl space walls.

It is claimed that the G.E. method of estimating heat gains retains the accuracy of accepted industry methods for calculating individual components of load, and at the same time, permits closer sizing of cooling equipment by establishing a reliable and practical relation between house construction and heat storage.

(*Concluded on page* 166)

LONDON LETTER

Commentary on developments in Europe by our correspondent in Great Britain

THE chamber was only just large enough. A crude method of humidification of the atmosphere was available by placing water in the shallow tray. The test was begun with electric heating in the floor panels, a high relative humidity, and just enough overhead heating to prevent condensation. After about two hours the R.H. was reduced and the heat output of the top panels increased. The experiment lasted about three hours and took place just a week before the end of 1954.

Having thus, by attention to oven climate control, proved that the turkey was tender, your Correspondent found the outside climate suitable for tree-pruning, mowing the lawn, and spraying the apples, peaches, pears and plum-trees. The instructions on the can of spray are to choose a day without snow, rain, wind, or frost. There are few such days here in the best of winters and they carefully avoid the week-ends when one is at home, preferring (like Summer) to fall on a Tuesday. The mild, dry weather lasted until the end of the year, much to the disgust of the townsfolk of Kendal in the Lake District, who had endured so much rain that they hoped to be compensated by the thought that it was an annual record.

The Radiative Environment

Some people blame the most recent atom experiments (just as their great-grandfathers blamed the railways) for upsetting the weather, and certainly the average year seems to be as rare as the average man. To read, in a paper published in the Journal of the Institution of Heating and Ventilating Engineers in 1954 (**21,** *224,* 1) that "the weather during the period of observation (1950-51) differed appreciably from normal" is almost mirth-provoking. These particular observations were made at a Ministry of Works store building in north-west London. This is a one-story building, 50 ft long and 20 ft wide, with its longitudinal axis running East and West, the nearest building (also single-story) being 35 ft from the North wall. It was unoccupied and unheated from May, 1950, to April, 1951, and was thus in a state of natural heat exchange with its surroundings. The walls are 13½ inch brickwork, unplastered, and the roof is flat, consisting of 5 inches of reinforced concrete with 1 inch screeding and bituminous-felt covering.

Very extensive observations of this heat exchange were made by A. C. Pallot and reported in 27 tables of data contained in his paper entitled "The Radiative Environment of Buildings and Its Effect on Heat Transmission." He begins with a review of previous work on radiation from the sun, atmosphere and ground, pointing out that on average the direct radiation from the sun is a small part of the total received from all sources if one counts the long-wave radiation of about 10 microns wavelength. Apparatus was installed to measure radiation of all wavelengths, direct and diffuse, on roof and all walls.

The roof receives direct and diffuse radiation from the sun, and atmospheric radiation. A vertical wall receives only half the atmospheric radiation that falls on the roof, but it also receives radiation from the ground, and this latter is of the same order as the atmospheric radiation. In fact, the figures obtained for all walls showed the ground radiation to be almost exactly equal to the solar and atmospheric radiation taken together. Averages for the year varied from 136 Btu (sq ft) (hr) for the South wall to 120 for the North wall, with not a lot of difference between summer and winter.

From the data are deduced the expectations for a year with normal weather, and a compass chart is drawn showing the normal radiative environment of a building for various months of the year. This shows the preponderance of radiation from the West, due to the fact that, in general, solar radiation is greater after noon than before noon. The values for direct solar radiation seem very low at first, for example 22 Btu per hr per sq ft of roof surface in July and 6 Btu in October. These are, however, averages (day and night) for a place (London) that is nearer the North Pole than is Calgary, Alberta. Mr. Pallot is at pains to point out the comparatively large amount of heat exchange by radiation that is going on all the time, and in so doing creates a feeling of unreality, because everyone knows that it is warmer in summer. It is rather like expressing all temperatures on the absolute scale (deg R = deg F + 459.6), aiming to heat an office block to 530 deg R, being only 1% out in the calculations, and achieving 525 deg or 535 deg R. There is quite a difference in comfort and in fuel consumption between 65 and 75 deg.

What really counts is the net heat gain or loss, and the table giving these figures shows that, although for the year as a whole the North wall received about 90% of the total radiation received by the South wall, for only two months in the year (June and July) did it receive more than it lost. The South wall had a net gain for nine months of the year. If the radiative environment is so cold that there can be a net loss by radiation even when the wall temperature is below that of the air, the effect of wind speed becomes reversed. With a 20 mph wind the heat loss can be less than in still air. In January the "sky temperature" can vary from +40 to −45 deg in these latitudes, and the heat loss from a roof varies in consequence between wider limits than are produced by variations in wind velocity.

It is suggested that this effect may help to explain the vagaries in fuel consumption for central heating for days of apparently similar meteorological conditions.

The data are used to calculate U values and heat transmission through the walls and roof of the building used for the experiments. This must be considered to be a notable achievement, since apparently no fuel or artificial heating was used, the observed temperature differences between inside and outside being produced from natural causes and thermal lag. The following table gives the results obtained, by categories of exposure.

13½ brick, unplastered wall	Sheltered	Normal	Severe
	Values of U		
S. Wall	0.32	0.34	0.35
E. Wall	0.36	0.37	0.38
N. Wall	0.39	0.40	0.41
W. Wall	0.34	0.36	0.37
6 in. concrete roof	0.61	0.64	0.66

These are very similar to the IHVE values except that the figures for the North wall are rather higher than, instead of being the same as, those for the East wall.

Sunshine in Italy

A wholly different picture is given by Dr. Ing. F. Squassi, the Italian heating and ventilating engineer, in a paper contributed to *Chaleur et Industrie* (**35,** *349,* 215) and modestly entitled "Some Characteristics of Insolation". Rome is on the same latitude as Chicago, and has a better view of the sun than London has. Dr. Squassi's paper does not mention rain, and there is just a short reference to cloud at the end where he says that the diffuse radiation makes up for the loss in direct radiation, so that clouds make very little difference. This is the same point as was made by Mr. Pallot, this time at a very different temperature level because Dr. Squassi is concerned with summer air-conditioning, not winter heating. It must be scientifically correct, even though it offends commonsense. Everyone knows that it is a lot cooler if the sun is obscured by cloud. The explanation must again be a matter of averages. If the sky is four-tenths overcast, the sun will be obscured 40% of the time; the remaining 60% there will be full direct radiation plus diffuse radiation from surrounding clouds.

The paper begins with an exposition of the way in which the radiation from the sun which reaches the outside of the Earth's atmosphere is reduced before arrival at a particular building on the terrestrial surface. Absorption by gases (particularly ozone), by water vapor and by dust, cuts down the amount we receive. also the inclination when the sun is not directly overhead reduces the amount falling on each square foot measured in the plane of the Earth's surface. The absorption is nearly proportional to the mass of the atmosphere through which the rays have to pass. If the Earth is assumed to be flat, a very simple formula can be derived. The thickness of the atmosphere is inversely proportional to the sine of the angle of the sun above the horizon. Thus at 30 deg above the horizon, sin 30° = ½, and the thickness is twice as great as if the sun were overhead. Actually, since the Earth is curved, when the sun is low in the sky the thickness is a good deal less than is given by this formula, but there is no problem of too much sunshine in the early morning or late evening and the simple formula is good enough for all practical purposes.

For the latitude of Rome, Dr. Squassi gives the formula: $J = J_o \times p^m$

in which p has the value 0.7, $m = \frac{1}{\sin h}$, J_o is the solar constant (429 Btu per (sq ft) (hr), and J the heat actually received. Strictly speaking, this value of J_o only applies for April 1 and early October, increasing to 1.033 times this mean value in mid-July and falling to 96.7% of it in mid-January. A graph on an hourly basis shows that the direct sunshine can reach a value of nearly 300 Btu per (sq ft) (hr) at midday.

The British are Optimists

Undeterred by living farther north than Winnipeg, Dr. H. Heywood constructed at the Imperial College of Science and Technology in London at flat-plate absorber 1 ft square and proceeded to measure the rate of heat-absorption from the sun in relation to solar intensity and plate temperature. He went further and built a larger absorber which has been working for four years at his home in Kent. This was of ingeniously simple design, consisting of two sheets of corrugated galvanized iron placed in "mirror image" position so that eight water channels were formed along the length of the absorber. The edges were riveted and soldered, and headers fitted at top and bottom. The back was insulated and the front blackened and covered with two layers of glass. A hot-water storage tank was placed at a level slightly higher than the top of the absorber, and the total capacity of 12 gallons represented 10 lb of water per sq ft of surface.

This was operated under various conditions, such as drawing-off water to restrict the temperature to 15 deg above air temperature, or to 135-140 deg as if for domestic use, or with no draw-off to determine the maximum temperature-rise obtainable. An experiment under the latter conditions resulted in a final temperature of 170 deg on a July day with continuous bright sun.

The following year daily observations were made from March to July (even this optimist concedes that no useful output would be obtained during winter), and the very interesting graphical record shows the hours of sunshine, the total incident radiation and the heat actually absorbed for each day during this period. These results are included in a paper presented by Dr. Heywood to the Institute of Fuel recently (*Journal* **27**, *162,* 334) and entitled Solar Energy for Water- and Space-heating. The author himself concentrated more on the water-heating aspect for this country, winter space-heating being out of the question, but speakers in the discussion referred to parts of the world where the prospects (and sunshine) are brighter, to greenhouse heating, and to the idea of using a solar collector in conjunction with a heat-pump. Miss M. V. Griffith reported that the Electrical Research Association had used a heat-pump with a buried-pipe collecting system for three successful heating seasons. The system had faltered when the outside temperature dropped to below 20 deg last February, and, the cooling of the ground in such a system being progressive, some assistance from solar radiation in the late autumn and perhaps odd days in December through February might make all the difference. They intended to try something out this winter.

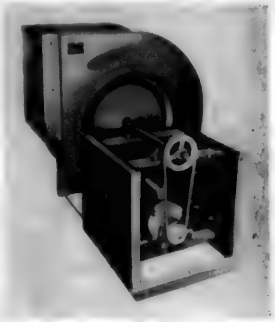
NEWS OF EQUIPMENT AND MATERIALS

The majority of new equipments and materials described here were shown for the first time at the 12th International Heating & Ventilating Exposition at Philadelphia, January 24-28.

Use the convenient prepaid postcard on page 142 for securing additional information on items described in this department.

Fans Have Higher Ratings

A new line of utility fans, with high NAFM certified ratings over its entire range of sizes, is announced by the Trane Company, La Crosse, Wis.



The assembled fan units are ready to install and are available with either direct or belt drive, and either forward-curved or backwardly-inclined blades. They include all standard NAFM sizes between 4½- and 30-inch wheel diameters; capacities up to 15,450 cfm and static pressures up to 2 inches of water are available.

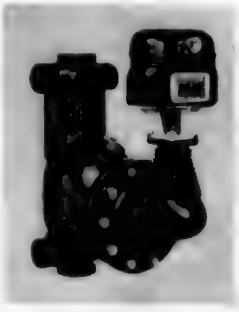
Other features of the fans are low outlet velocity, lock-seam housing, and adjustable overhanging sheave drives. This last feature permits fan belts to be replaced without disassembly, reassembly and realignment of the fan.

For particular applications, the fans are made of special metals, in spark-resistant construction, and with special coatings and finishes.

More information? Circle Item 1 on postcard page 142.

Magnetic Water Level Control

A low water cut-off control, the No. 192, employing magnetically operated switches is introduced by McDonnell & Miller, Inc., Chicago, Ill.



The unit is designed to control a boiler feed pump from the boiler water level; to stop automatic burners in the event of an emergency low water condition; and to close an electrical circuit operating an alarm device when low water occurs.

Rated at 250 psi, the control is operated by an alloy float pivoted on flat beryllium copper springs and has tappings for gage glass and try cocks.

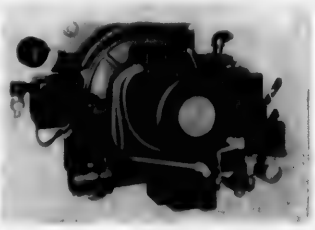
Alnico magnets mounted on the contact arm of each switch and on the float arm, with like poles facing each other, provide a direct action control of the electric circuits as the float arm rises and falls between the switch magnets.

A detailed description of the device is given in Bulletin L-119.

More information? Circle Item 2 on postcard page 142.

Oil Burner Is Improved

An automatic rotary-type burner, model 53, for either oil or combination oil and gas, is introduced by S. T. Johnson Co., Oakland, Calif., and Bridgeport, Pa.



The burner is equipped with both a suction pump and a positive-displacement metering pump that permit automatic starting when the oil is cold. They are available in sizes ranging from 25 to 400 hp and are made for either gas-electric or diesel-electric ignition. Direct drive is standard equipment of the burner but it is also made with a belt drive.

The dimensions and capacities of the burner are listed in a folder available from the company.

More information? Circle Item 3 on postcard, page 142.

Mushroom-Shaped Ventilator

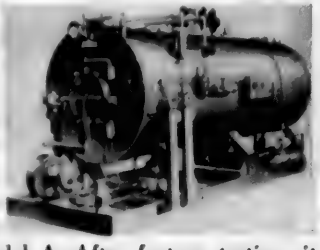
Centrifugal ventilators that may be used on ducts, bonnets, and hoods as well as roof outlets, are being made by General Blower Co., Morton Grove, Ill.

Available with either direct or V-belt drive, the blower has backward curved fan blades and is mounted integrally with the motor and drive assembly. The hemispherical top, which is hinged and latched for locking, and concave trunk are made of spun metal.

More information? Circle Item 4 on postcard, page 142.

Boiler Made Smaller

Built to the same specifications as the Model A Amesteam generator line, but delivering equivalent horsepower in smaller physical space, is the Model X packaged steam generator being produced by Ames Iron Works, Inc., Oswego, N. Y.



Of three-pass design, the new model has a minimum of four square feet of heating surface per boiler horsepower and is priced lower than the Model A. After factory testing, it is shipped as a ready-to-fire unit, complete with burner, controls, insulation and jacket.

The boiler is available in nineteen sizes, 15 through 600 hp, for pressures from 15 to 200 psi.

More information? Circle Item 5 on postcard, page 142.

New Baseboard Technique

A new technique of baseboard panel installation, developed by American Radiator & Standard Sanitary Corp., Pittsburgh, Pa., was demonstrated publicly for the first time at the Home Builders Show in Chicago. This method of cutting and installing baseboard panels decreases working time and cuts costs of installation.

Instead of the time-consuming method of sizing and then cutting panels at the shop or at the job site with a hack saw, the company's Heatrim panels can now be cut quickly and accurately to size right on the job. All that is needed for this simplified application is a portable power-saw which is hand operated, and a wooden cutting bench designed by the company. This bench, on which the panels are sized and cut, can be constructed easily from scrap lumber at the job site.

One man, by using this technique, can cut all the baseboard panel parts as fast as the helper can install them. With the helper hanging enclosures and sizing the wall areas, a complete installation can be finished in considerably less time than was previously required. The man at the cutting bench can quickly clean and ream the heating element tube ends as well as the various fittings necessary.

More information? Circle Item 6 on postcard, page 142.

Ceiling-Mounted Evaporator

A line of direct expansion evaporators, with blowers as an integral part of the units, is placed on the market by Peerless of America, Inc., Chicago, Ill.

The new units, as described, are intended for cases where it is possible to permit the direct expansion of the refrigerant in the evaporator. By mounting on the ceiling installation is permitted in attics, closets, vestibules and other out of the way spaces.

The units are available in ½-, 1-, 1½- and 2-ton capacities.

The evaporators are also available with condensate pump and for use in handling cold water where direct expansion is not desired.

A brochure is available.

More information? Circle Item 7 on postcard, page 142.

New Gas Furnace Announced

The addition of a gas-fired warm air furnace, the series 10-A, to its regular line is announced by Pennsylvania Furnace & Iron Co., Warren, Pa.

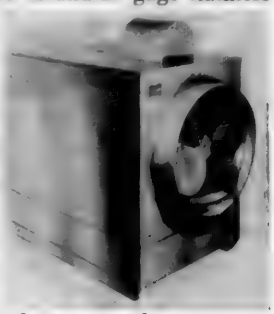
The new series furnace is made in sizes ranging from 75,000 to 225,000 Btu per hr input that will deliver from 57,000 to 171,000 Btu per hr at the register.

Solenoid and diaphragm type conversion gas burners were also announced as available with 8-, 10-, or 12-inch burner diameters.

More information? Circle Item 8 on postcard, page 142.

Stainless Steel Cooling Towers

Cooling towers constructed of 18 and 20 gage stainless steel are new products of Morris Sheet Metal Works, Columbus, Ohio.



The towers are made in a variety of sizes ranging from 24 inches wide, 38 inches long, 30¼ inches high, to 30 inches wide, 78 inches long, and 73½ inches high. Redwood is used for the wet deck surface and a stainless steel gravity-type distribution basin is used instead of spray nozzles.

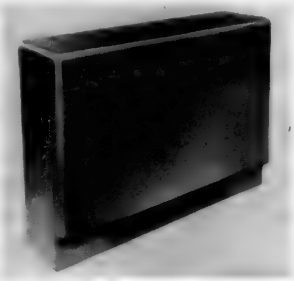
Powered by 1/20 to ½ hp electric motors, the towers can deliver air to 30 feet of straight duct having the same cross-sectional area as the tower discharge.

Specifications and capacity tables are given in a booklet issued by the company.

More information? Circle Item 9 on postcard, page 142.

Remote Air Conditioning Unit

Roomaire, a remote type room air conditiong unit providing year round air conditioning of individual rooms in multi-room installations, is introduced by Young Radiator Co., Racine, Wis., and Mattoon, Ill. It is available in three sizes of 200, 400, and 600 cfm, with nominal cooling capacities of ½, 1, and 1½ tons. The three models, numbers AC-2FW, AC-4FW, and AC-6FW, are offered in 36, 51 and 66-inch lengths, respectively, each 25 inches high and 9¼ inches deep. They are powered by sleeve bearing, shaded pole, multi-speed motors that range from 1/30 hp, for the smallest unit, to 1/12 hp for the largest. All are equipped with permanent, cleanable filters.



For cooling, chilled water is circulated through the coil; for heating, hot water is used. When neither heating nor cooling is desired, the fans can be operated to provide ventilation and air circulation.

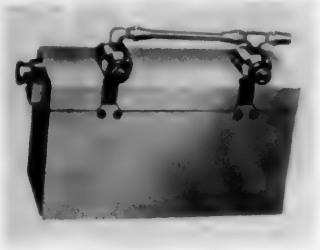
The damper in the fresh air inlet in the back of the unit is manually adjustable and regulates the amount of fresh air to be mixed with recirculated air. Control of the water flow through the heat transfer coil can be made by a manual valve or automatic valve operated by a temperature control device.

Specifications and capacity tables are included in the company's catalog 7754.

More information? Circle Item 10 on postcard, page 142.

Unit Humidifies Small Rooms

A humidifier for use in small rooms and enclosures, where smaller capacity units are desirable, is announced by Spraying Systems Co., Bellwood, Ill. Identified as the No. 6110 humidifying unit, the equipment provides humidity adjustment for rooms up to about 12,000 cu ft in size.



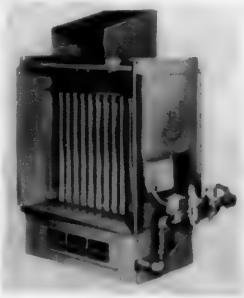
The unit consists of two ¼-JH humidifying nozzles and a water supply tank with a float valve. Accessory equipment supplied as needed to complete installation includes a humidistat, an air filter, an air pressure regulator and a solenoid valve. Operation of the unit is by compressed air, to siphon water from the supply tank and for projection and atomization of the spray.

At the recommended operating pressure of 32 psi, the unit will atomize water at the rate of 2 gph and use 2.9 cfm of air.

More information? Circle Item 11 on postcard, page 142.

Gas-Fired Duct Furnace

A gas-fired duct furnace designed for convenient installation in warm air heating, ventilating and air conditioning systems is a new product of Modine Mfg. Co., Racine, Wis. The furnace can be installed directly in the ductwork, with air circulated through it by a remotely located blower, and can be installed as a single unit or as one of a series, depending on heating requirements.



Airflow through the unit can be reversed if desired. Because of the stainless steel construction of the heat exchanger and burner, the duct furnace can be installed either upstream or downstream from air washers and cooling coils in an air conditioning system. This feature frequently eliminates the need for space-consuming and costly face and by-pass dampers, and controls in an air conditioning system.

A compact and concentrated source of gas-fired heat, the unit is suitable for use as a central heat source, as a booster unit to supplement a central plant or for combinational use with air cooling equipment.

Stainless steel used in the burner and heat exchanger provides maximum protection against clogging of the burner and rusting of the exchanger tubes. Lighter weight made possible by the use of this metal has eliminated useless dead weight and made installation faster, easier and less expensive. Heat exchanger tubes are die-formed and seam welded into gas-tight structures to permit direct firing, immediate heat and uniform heat transfer.

Burner ports are elongated in shape and have approximately four times the free area of conventional drilled ports. Gas passages of the burner and manifold are die-formed and are welded into an integral unit sturdily encased in an aluminized steel burner box.

The entire burner assembly is installed in a drawer that can be withdrawn for inspection or servicing. The control assembly is mounted on the side of the unit where it is easily accessible.

A fully automatic gas shut-off prevents gas from escaping into the atmosphere if the pilot light should go out. When the unit is not operating or in case of a power failure, automatic controls prevent gas from entering the burner. A high limit control shuts off gas to prevent overheating if the fan operation is stopped or if air delivery is impeded. The control re-sets itself after normal fan operation is resumed. The gas regulator automatically maintains correct operating pressure. Manual shut-off and pilot valves are provided for servicing convenience.

More information? Circle Item 12 on postcard, page 142.

Atomizing Air Washer

A slinger-type air washer, the Airfan, is introduced by Airfan Engineering Co., Los Angeles, Calif., for summer air conditioning in homes, offices, and factories.

The units are equipped with two washer sections, one on each side of the blower, and four slingers. There are two slinger wheels on the double shaft motors that are capable of atomizing 11 gallons of water per minute.

The two washer sections of a 100,000 cfm capacity unit are shown in the illustration.

More information? Circle Item 13 on postcard, page 142.

Backward Curve Blower Wheels

Its new line of backward curve blowers is introduced by The Peerless Electric Co., Fan and Blower Div., Warren, Ohio. The new blowers round out the line and follow on the heels of the KE-9 kitchen hood exhauster introduced last month.

The blower is being manufactured in all N.A.F.M. recommended sizes from 12½ to 36½ inches. It has self-limiting horsepower characteristics and meets all performance standards and requirements.

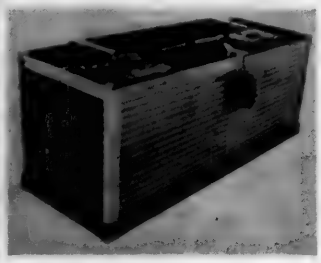
Feature of the blower is the dynamically balanced wheel. It permits smooth, quiet entry, passage and exit of air. The wheel has a matching spun cone. A heavy cast-iron hub provides total support and assures maximum balance throughout blower life.

Housings are available for outdoor installations. The motors are job matched.

More information? Circle Item 14 on postcard, page 142.

Low Line of Cooling Towers

A completely new line of mechanical draft cooling towers for air conditioning and small industrial applications is introduced by J. F. Pritchard & Co. of California, Kansas City, Mo. This new Lo-Line of induced draft tower is specifically designed to solve two problems: First, with its low overall height and attractive exterior casing of corrugated cement asbestos board, it meets the trend toward suburban building which has made longer, lower-lined buildings possible; Second, it answers the demands of metropolitan buildings where cooling towers must still be mounted on the roof, by providing a low silhouette which can be easily concealed.



While the tower is designed to accommodate conventional external water supply piping, concealed internal supply piping is available as an optional feature to further enhance the architectural appearance.

Careful consideration has been given to ease of lubrication by bringing all fittings to the outside of the tower where they may be reached without aid of ladders. Attention has been given to low maintenance through the use of hot dip galvanizing of all steel parts. Stainless steel is employed in the fan shaft. Sizes are available up to 75 tons.

More information? Circle Item 15 on postcard, page 142.

Adds 4 Inch Tempering Valve

A new 4-inch tempering valve is announced by Holby Valve Co., New York, N. Y. This fills out a full range of sizes from ¾ to 4 inches. The valve maintains a close tolerance to the temperature it is set for, and has proven itself satisfactorily in hard water areas. The manufacturer claims that there are substantial savings of labor and materials in installation, as no trapping of the valve is required.

More information? Circle Item 16 on postcard, page 142.

Baseboard System Heats, Cools

An integrated year-round baseboard heating-cooling system is announced by The Vulcan Radiator Co., Hartford, Conn. The new system has been integrated with the company's line of baseboard radiation so that, by the flick of a switch, the home owner can command either warm or cool air from the same baseboard installation.

A feature of the system allows independent operation of the boiler for domestic hot water, and at the same time allows chilled water to flow through the baseboard piping system for cooling the home during hot months.

The system incorporates a chiller that provides chilled water through the same baseboard facilities as those used for heating; a central blower distributes a controlled quantity of air under the entire length of each baseboard radiator element, thereby insuring a smooth, balanced flow of cool air by induction. Condensation is carried off via built-in drain ducts.

More information? Circle Item 17 on postcard, page 142.

3 Types of Mechanical Filters

Three types of cleanable air filters are introduced by Trion, Inc., McKees Rocks, Pa. One is a panel impingement filter, consisting of galvanized screen filtering media arranged in closely spaced rows of double air scoops which insure efficient air filtering, and available in single panel and multiple banks of filters. The second is a self washer type with an automatic washing device attachment for banks of panel impingement filters which thoroughly cleans the filters of collected dirt particles. This feature keeps maintenance labor costs to a minimum. The third is of the traveling curtain type. A motor driven assembly rotates the filter panels through an oil bath for constant cleaning of the filter media.

More information? Circle Item 18 on postcard, page 142.

Low Silhouette Ventilator

The AirMpeler Lo-Boy power roof ventilator, with a belt-driven, centrifugal backward-curve blower wheel, is said to have an unusually low silhouette because the motor is mounted on side of housing instead of on top. It is a new product of AirXpeler Div., C. L. Ammerman Co., Minneapolis, Minn.

The intake to the blower wheel is through the spun inlet on the square curb base. The outlet is downward and out radially from beneath the hood in which the wheel and the motor are enclosed. Finish is gray enamel to protect against exposure.

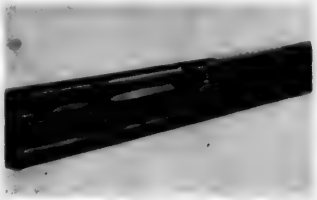
The motor is a standard unit ball bearing and is located on the side of the housing where it is out of the air stream. The unit has safety disconnect switch; damper section available for automatic or motorized louver type dampers.

Base dimensions range from 24 to 84 inches and free air delivery from 800 to 47,000 cfm.

More information? Circle Item 19 on postcard, page 142.

Pushbutton Diffuser Control

An automatic pushbutton control on its perimeter extended baseboard diffuser is a feature announced by The Lima Register Company, Lima, Ohio. It provides fingertip control of air in heating and cooling. By pushing in on the pushbutton screw, the damper automatically opens and locks into the pre-balanced position. By pushing up, the damper automatically snaps closed for positive air shut-off.



Balancing is easy whether the damper is in open or closed position. The pushbutton adjusting screw can be turned with the fingers to the correct valve setting for proper balance.

The positive spring tension eliminates any possible rattling and keeps the valve from being forced closed by the air velocity. Split-second air shut-off is assured as the hinged damper runs full length of the louver openings and snaps tightly closed with double spring action.

Both the four foot and two foot sizes of baseboard diffusers are now available with this automatic pushbutton damper control at no extra cost.

More information? Circle Item 20 on postcard, page 142.

Completely Enclosed Motor

An integral hp motor is introduced by Marathon Electric Mfg. Corp., Wausau, Wis.

Made in three phase and single phase, it is enclosed in a cast iron frame that provides weatherproof features in several mounting positions. The frame and feet are cast integrally. The motor has single end-thru ventilation.

More information? Circle Item 21 on postcard, page 142.

Weather Controls Indoor Heat

Settings for adaptation to heating requirements of multiple occupancy buildings are features of a new Weather-Man control added to its line by Automatic Devices Co., Inc., Western Springs, Ill. The new control has a remote outside temperature sensitive bulb. The regulator case is installed indoors. A program dial automatically controls day input, night setback, and morning build-up of heat, according to the changes in the weather.

Another feature is a manual dial that can be positioned to increase or decrease variably the amount of heat flow for special requirements. A hand switch is also provided for manual on and off operation without disturbing the dial setting. The regulator operates with all types of fuel and is intended for residential, commercial or industrial use.

More information? Circle Item 22 on postcard, page 142.

Fans with Enclosed Drive

A line of completely enclosed drive blowers, in sizes from 10 to 36 inch wheel diameters, is introduced by Utility Fan Corp., Los Angeles, Calif. The enclosure provides ability to withstand prolonged weather abuse.

The blower is a self-contained unit with pulleys, V-belts and motor accurately pre-engineered. Easy to install, they require minimum floor space and have an adjustable motor base for periodic belt adjustment. Another feature is a design which permits replacement of the motor and drives without disassembling any part of the blower.

Weatherproof covers have been incorporated as a standard feature of blowers geared for outdoor installation.

More information? Circle Item 23 on postcard, page 142.

2-Stage Cooling Unit

A cooling unit employing the two-stage cooling principle has been developed by Hastings Air Control, Inc., Omaha, Nebr.

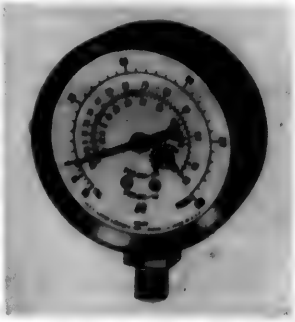
The unit has a cooling capacity of 5 to 7 tons, depending upon water temperature, and uses a 3 hp compressor. The difference in capacity is gained by first using the condenser water for pre-cooling the entering air. The cooling section consists of a 4 row copper water coil and a 2 row copper Freon coil.

The unit is designed to operate using water up to 70 deg.

More information? Circle Item 24 on postcard, page 142.

Compound Gage for Freons

Compound pressure-temperature gages for reading both Freon 12 and 22 are introduced by Jas. P. Marsh Corp., Skokie, Ill.



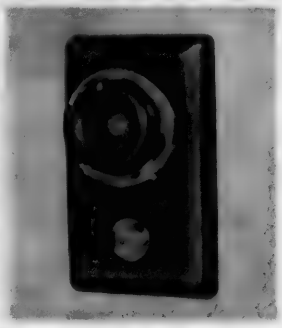
The gage dials are graduated with corresponding temperature scales for both gases. The pressure and vacuum readings are printed in black and the corresponding Freon temperature markings in red.

Each gage is set in a black steel case and ring, and is equipped with a recalibrator and 1/8-inch, NPT male bottom connection and restriction screw.

More information? Circle Item 25 on postcard, page 142.

Thermostat for Electric Heat

A room thermostat which has been designed specifically for use on such electric heating installations as radiant-cable heat, radiant-glass panels, radiant-electric baseboards, and rubber panels is announced by White-Rodgers Electric Co., St. Louis, Mo.



The manufacturer states that an entirely new type sensitive heating element is used to obtain extremely sensitive reaction to both radiant heat and air temperatures, and that the color of the element case has been chosen so that it has heat absorption qualities similar to that of the human body. This provides a very narrow differential, keeping variations in the heating panels to a minimum. Mounted flush in the wall, the thermostat is modern in appearance with the thermo element directly exposed to air and radiant effects, and designed so that the switching mechanism mounts directly into any standard 2 by 3-inch outlet or conduit box. The switching mechanism is of quiet design with no clicks, chatter, whirr, or arc-flash. The range of the thermostat is from 55 to 85 degrees with knob setting. It can also be turned to the cold position for temporary shut-down of heating element. Electrical ratings are 2,500 watts, 120 volts a-c; or 5,000 watts, 240 volts a-c.

More information? Circle Item 26 on postcard, page 142.

Condensers Can Be Banked

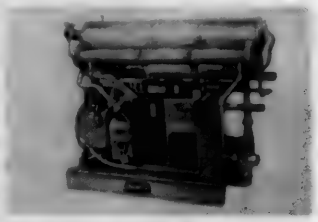
The Aircon, an air-cooled condenser for dry localities, is being produced by McQuay Inc., Minneapolis, Minn. The unit is constructed so that several can be banked together to provide 20-, 25- and 30-ton systems or larger.

Intended for residential and intermediate commercial applications, the condensers are available in 2-, 3-, 5-, 7½-, 10- and 15-ton models.

More information? Circle Item 27 on postcard, page 142.

Packaged Chiller Unit

The PC unit, a completely packaged chiller unit, Freon-charged, ready for plug-in operation, is a new product of Heat-X, Inc., Brewster, N. Y. It features inner-fin construction of refrigerant passages, permitting a compactness of design said never before to be possible. The unit is shown in the accompanying photo.

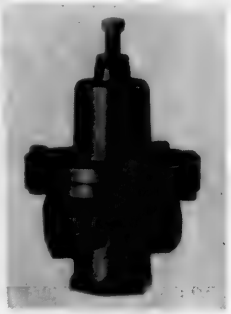


Other new products of the company include: Inner-Fin water chillers, compact shell and tube chillers; a line of IC condensers, Inner-Fin shell and tube condensers with all water surfaces of non-ferrous construction, eliminating any corrosion problem. Single pass, eliminates any oil trapping problems; and Inner-Fin heat interchangers for increasing system capacity. Because of use of longitudinal fins on suction line, pressure drop is low. These are heavy duty units.

More information? Circle Item 28 on postcard, page 142.

Pressure Reducer — Regulator

A pressure reducing and regulating valve with extremely low pressure drop and lockup is added to the line of A. W. Cash Co., Decatur, Ill. Known as Standard Type 1260, the self-contained, single seat valve operates within a range of 300 psi inlet pressure and 3 to 250 psi delivered pressure. It combines minimum size and weight with greater sensitivity.



The valve is designed for a wide range of applications, including water, gas, steam, air, oil and other non-corrosive fluids. Low pressure drop is achieved through use of the venturi principle. Velocity of gas or liquid passing venturi orifice creates suction, reducing pressure in lower diaphragm chamber and opening valve wider to produce lower pressure drop.

Another feature of the valve is a spherical, self-cleaning inner valve. Free rotation of the ball permits different seating position at closure, adding substantially to the life of the valve. Still another feature is a new large area built-in strainer.

The valve is available in aluminum, bronze, iron, steel or other specified materials. Interior of the valve is readily accessible for easy servicing without removal from the pipeline.

More information? Circle Item 29 on postcard, page 142.

Flexible Line of Water Savers

Two entirely new concepts, one of design and one of construction, are incorporated in a line of water savers introduced by Bush Mfg. Co., West Hartford, Conn.

The units have all-copper construction of wetted deck surfaces and eliminators. Company officials point out that since copper cannot rust or rot, this type of construction eliminates the deterioration problem.

Another feature of the line is interchangeability of parts. The unit can be arranged as the CDT cooling tower or IEC evaporative condenser merely by utilizing either the Inner-Fin coil or the copper decking. Whichever type water-saver is desired can be equipped with either blower fan or propeller fan.

The 4-way flexibility is said to be a benefit to wholesalers and contractors, since complete stocks can now be maintained without carrying excessive inventory.

More information? Circle Item 30 on postcard, page 142.

Unit Dispenses Hot or Cold Water

An office-type water cooler, which also dispenses hot water at the correct temperature for making instant coffee and other hot beverages, is a new development of Ebco Mfg. Co., Columbus, Ohio. It is available in both pressure and bottle types, and is called the Oasis Hot 'n Cold water cooler.

The pressure model has an additional red-colored gooseneck spigot for hot water as well as the conventional spout for cold drinking water. The pressure type has a hot water capacity of five quarts, or approximately 25 full cups, and has a recovery rate of from 40 to 60 cups an hour.

The bottle type has two push-button faucets in the front of the cabinet, one colored red for hot water, the other blue for cold water. This model also has the same hot water capacity and recovery rate as the pressure model.

The hot water tank, of 85/15 red brass, has a 500-watt tubular type heater attached to the outside. It also features a surface type thermostat which adjusts to 185 deg and prevents the heater from burning out should the storage tank be permitted to run dry.

For cold drinking water, the cooler has a copper alloy cooling and storage tank which uses cold waste water to pre-cool the incoming water before it reaches the storage tank. A compressor motor is spring-mounted internally to eliminate noise and vibration.

Piping is already installed in the pressure-type unit to provide for a remote wall fountain.

More information? Circle Item 31 on postcard, page 142.

Valve Top Seat Is Protected

Two union bonnet, rising stem, gate valves are introduced by The Fairbanks Co., New York, N. Y., for general use on steam, water, gas, and oil lines.

Both the 125 lb, U-0252, and 150 lb, U-0226, valves feature a protected top seat above the stem threads and out of the line of flow. This design permits repacking under pressure when the valve is wide open. The bonnets of both valves are two-piece with a radial seat.

The valves are furnished with solid taper wedges and malleable iron hand wheels. Their specifications are listed in a circular, V-25, issued by the company.

More information? Circle Item 32 on postcard, page 142.

Cooler for Mobile Homes

An air conditioning unit developed specifically for mobile homes is announced by Carrier Corp., Syracuse, N. Y.

The manufacturer states that the unit was fashioned expressly to meet a whole list of requirements laid down by mobile home experts in order to overcome past objections to air conditioning unit design. One important requirement was that no equipment should be mounted outside the mobile home. This unit fits entirely inside and requires no openings in the walls or roof. It serves as an end table, as well as an air conditioner. The unit is a compact ¾ horsepower floor-type conditioner serving as a functional piece of furniture. By design the unit fits neatly into the living room or bedroom of the mobile home. It can be placed alongside of the living room couch in the area occupied by an end table in the majority of mobile homes. Other suitable locations include the space between or alongside beds. The manufacturer claims that the unit is easily installed and there are no problems of providing structural support for a wall, window or roof-top installation. Air for refrigeration condensing is drawn through an opening in the floor, thus providing high performance even in midsummer days when the intense radiant heat of the sun reduces the effectiveness of roof-mounted equipment.

More information? Circle Item 33 on postcard, page 142.

Fire Hose Rack Deters Vandals

A steel welded fire hose rack, the Allenco Bowes, that supports over 500 lbs, is announced by W. D. Allen Mfg. Co., Chicago, Ill.

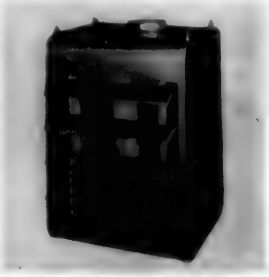
The entire weight of the hose is borne by the frame of the rack. Inserted out of sight in the rack, are the pins bearing the hose. This feature is intended to discourage vandals from removing the pins and assembly screws or rivets.

The nozzle clip on the right end of the rack will hold any standard size plain nozzles.

More information? Circle Item 34 on postcard, page 142.

Oil-Fired Unit Heater

A 140,000 Btu per hour oil-fired, suspended type unit heater is announced by Interstate Heater Mfg. Co., Denver, Colo.



The heater is a self-contained, factory assembled and wired unit, requiring only a vent, electric outlet and tap to fuel supply. It is equipped with a Century Engineering gun type burner and Minneapolis Honeywell thermostat controls. The fan provides a throw of 50 feet and can be used in the summer for ventilation. The heater uses low cost No. 2 commercial fuel oil.

It is designed for permanent heating installations in factories, garages, gas stations, stores and warehouses, and for temporary use during construction. Several units may be connected to one fuel oil line.

More information? Circle Item 35 on postcard, page 142.

Electronic Air Cleaners

An entirely new line of electronic air cleaners has been announced by Electro-air Cleaner Co., Pittsburgh, Pa.

The new units include built-up line and custom line equipment suitable for use in connection with all sizes of industrial and commercial building areas, and compact line units, from 800 to 3,000 cfm capacity, designed for homes.

Many features, new to the industry, such as a self-adjusting single circuit and selenium rectifiers are incorporated in the design. All lines fill the demand for long needed, lower cost, but highly efficient electronic air cleaners for homes and industrial and commercial building installation.

More information? Circle Item 36 on postcard, page 142.

High Velocity Control Unit

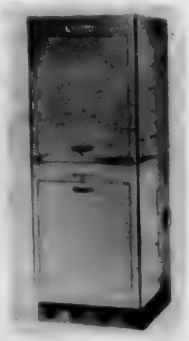
A new model of its Uni-Flo high velocity control unit is available from Barber-Colman Co., Rockford, Ill. This model, the HVS is available with either a round or rectangular inlet and a flanged outlet. It is designed for use in systems requiring high velocity trunk ducts and conventional velocity branch ducts and reduces high velocity air to conventional velocities at minimum noise levels.

The contractor merely has to connect the inlet to the high velocity trunk duct and the flanged outlet of the unit to the branch duct; the branch duct is then continued in the usual manner with no further pressure reducing devices needed. Four standard sizes of the HVS are available to meet most requirements, and it can also be furnished in special sizes to handle larger volumes.

More information? Circle Item 37 on postcard, page 142.

Integral Boiler and Chiller

A gas-fired hot water boiler and water chiller, combined in one compact package is a new development of Hydraline Products Div., Borg-Warner Corp., Kalamazoo, Mich. It is engineered and designed for modern forced water year-round air conditioning systems in medium-sized homes and small commercial structures.



The need for a custom-engineered central plant became apparent following the introduction of the company's Hydraline system and the trend to package heating and cooling with forced water.

The boiler-chiller combination can be installed in the basement, utility room or elsewhere in accordance with local building codes with the boiler below, chiller above (see photo). The height of the complete package is 66⅜ inches. However, when it is desired, because of little head-room or other limiting factors, the chiller and boiler packages may be placed side by side. Side by side, this combination measures 36 inches in height, 48 inches in width, and 24 inches in depth. An allowance of approximately 18 inches from the units to a wall or other obstruction is ample for piping and expansion tank.

The boiler unit is furnished completely assembled with water circulator, burners, controls and operating parts in place. It is shipped ready to be connected to water supply and return lines, gas supply and electrical service.

The companion chiller is factory assembled and shipped complete with evaporator, condenser, refrigeration and electrical controls. As with the boiler, this unit is self-contained in a chrome-trimmed, grey enamel cabinet. The compressor is hermetically sealed. There are convenient fittings for water supply and return, and connections for cooling tower applications.

The combination package is offered for complete year-round air conditioning, summer cooling as well as winter heating; however, the chiller or boiler may be added after theafter the initial installation, if desired.

More information? Circle Item 38 on postcard, page 142.

Regulates Heating and Cooling

A thermostat, that automatically selects either heating or cooling, and a compact panel, wired for either add-on or combination heating-cooling units, are announced by Minneapolis-Honeywell Regulator Co., Minneapolis, Minn. Mounted in the conventional location, the thermostat (illustrated) provides automatic changeover between heating and cooling according to the temperature changes in an air conditioned home.

One model, designated the T833B and designed primarily for use in southern areas, provides for complete shut-off of the system. Another, the T833C, permits shut-off of the cooling system alone.

Slide action switches, mounted on the face of the thermostat, control the fan for shut-off, continuous or intermittent operation. Bimetal sensing elements are featured for both heating and cooling control and individual levers make it possible to adjust heating and cooling control points separately. By the addition of a timer and transformer, the thermostat will provide automatic night-time setback of the heating system.

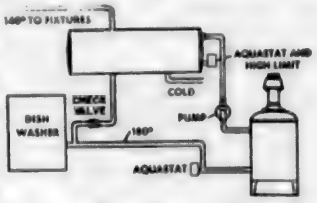
The W-212A control panel, designed for use with the new thermostat, is small enough for mounting in small combination heating-cooling cabinets. Although available in a variety of models, with or without pressure controls to meet requirements of various air conditioning equipment manufacturers, all panels are of the same physical size and external appearance. They are 7⅛ inches wide by 8⅛ inches high by 4 inches deep and are finished in a gray crackle finish.

The thermostat is horizontally mounted, and measures 2¾ inches by 5 inches by 1⅞ inches.

More information? Circle Item 39 on postcard, page 142.

System Keeps Water Hot

A two-temperature water heating system, called the Shure Temp Booster Recovery system, is announced by Permaglas Div., A. O. Smith Corp., Kankakee, Ill., for commercial installations employing the A. O. Smith-Burkay line of volume water heaters.



The tank is maintained at a temperature of 140 deg F for general purpose water distribution. For high temperature purposes, for example sanitation, the water is drawn from the tank to the heater and heated to a temperature of 180 deg.

The system automatically maintains the temperature in the transmission line to the sanitizing equipment, such as the dishwasher, thereby providing immediate high temperature water at the point required.

More information? Circle Item 40 on postcard, page 142.

High Velocity Converter

A high velocity converter, an air flow adjusting device designed to regulate the flow of air out of high velocity supply ducts, is introduced by Pyle-National Co., Chicago, Ill.

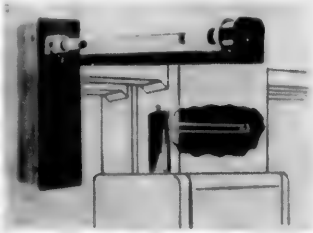
The device regulates the flow of air out of high velocity supply ducts by reducing the static pressure in the vicinity of the outlet, through the principle of static pressure regain. This converter makes possible the air conditioning of a room, or area, off a main high velocity supply duct, without need for bulky acoustical treatment.

The converter performs in a manner somewhat analagous to that of a toy electric train transformer. Whereas an electric train transformer will reduce 110 volts to 6 volts, in order to avoid shock and fire, this converter will bleed off into a room or area, from the high velocity air mains, just enough air to effect the desired temperature, without disturbing the flow and pressure of high velocity air through the central ducts. Just as a toy train transformer eliminates the possibility of shock and fire, this converter eliminates noise and blasts of cold air, as the air is channeled off the central ducts, into a room.

More information? Circle Item 41 on postcard, page 142.

Lamp Purifies Return Air

An electronic air purifier, the Sun-Lite Aire, is manufactured by Sampson Chemical & Pigment Corp., Chicago, Ill., for installation in the return air duct of warm air heating or cooling systems.



The purifier is designed to slip through a 2-inch opening into the duct and automatically lock itself to the outside duct wall. The unit consists of a transformer and a cold-cathode, 12,000 hr rated Vycor lamp that generates ozone-producing, ultraviolet rays and is furnished with a cord, a lamp, a luminous indicator, and installation instructions.

The lamp operates on 60 cycle a-c, 110-120v, and draws 20 watts. It will treat about 1,000 cfm of recirculated air.

More information? Circle Item 42 on postcard, page 142.

Industrial Air Conditioners

A typical item among those in its custom-made line, and featuring articulated unit construction, is the air treating unit shown by Air & Refrigeration Corp., New York, N. Y., at the recent heating and ventilating show in Philadelphia and here illustrated.

The unit is one of several installed on the roof of a large southern textile mill. Weatherproofed insulated panels with aluminum exterior facing form the housing for the spinning frame lint collecting fan as well as the air conditioning equipment. Another feature of this system is the use of a stainless steel axial flow fan to circulate up to 50,000 cfm of air under pressure to the spinning room.

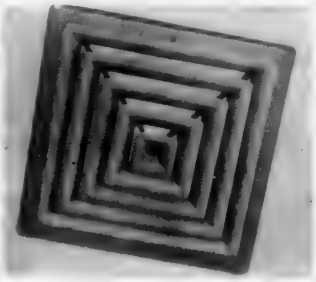
The basic air treatment element in this unit is the two-bank spray type air washer used for cooling and dehumidifying. To reduce roof load, a two-inch operating water level is maintained. This tank automatically drains itself upon pump shutdown. Special design permits eliminators to be cleaned without shutting down sprays or fan.

Because of physical size, articulated units are shipped knocked-down. Costly field labor is reduced to a minimum as no field fabrication or insulation is required. Each system is test assembled before leaving factory to assure matching of parts.

More information? Circle Item 43 on postcard, page 142.

Square Ceiling Diffuser

Styled to harmonize with rectangular rooms and modern, square block ceilings, a Square Design ceiling diffuser is introduced by The Lima Register Co., Lima, Ohio. It is equally efficient for heating and cooling and can be installed as either a warm air outlet or cooling outlet.



Featuring four-way diffusion without drafts, the square design and tiers of step-down vanes provide greater free area for more effective air distribution with a minimum of resistance. It is also recommended for return air outlets, especially in perimeter systems.

The mechanical damper delivers air through the center of damper, and can be tightly closed for full air shut-off. The light beige permanent finish can be repainted if desired. Available in six sizes from 6 x 6 to 20 x 20 inches.

More information? Circle Item 44 on postcard, page 142.

Cleaner and Filter Improved

A large filter area, that allows increased dirt capacity, is a feature claimed for a new heating and air conditioning system cleaner manufactured by Premier Co., St. Paul, Minn. Named Spic-Span, Model 950H, the unit is lightweight, portable, and has the power capabilities of other commercial units manufactured by the company.

The new feature in the unit is a pleated filter designed to give three times the former area with no overlapping or clogging. By use of this pleated filter, the unit has a greater dirt capacity than before. The filter also allows for cooler motor operation and higher cleaning efficiency.

The unit is powered by a ½ hp, 600 watt input, 115 volt a-c/d-c motor. Its bearings are ball type and sealed in lubricant. Standing 19 inches high, it has an outside diameter of 14½ inches and a tank capacity of ½ bushel.

More information? Circle Item 45 on postcard, page 142.

Range Ventilating Hood

Easy and rapid cleaning is made possible by the tilting feature on a kitchen ventilating hood, Model 239, announced by Pryne & Co., Inc., Pomona, Calif. Two thumb screws turn to lower the hood, and the unit can be lifted off for cleaning outdoors.

The self-contained unit is constructed with built-in three speed fan switch and light switch. Fan and light are in a section below the bottom shelf, to conserve cabinet space. The exhaust duct may go inside the wall behind the range, using no cabinet space whatever.

Installed under cabinets, over the kitchen range, the hood combines an exhaust ventilator and a 100 watt recessed light fixture. The unit exhausts greasy vapors and provides light over the range area.

Hoods for 30-, 36-, 39-, 42- and 48-inch cabinets come in coppertone, baked white and stainless steel.

More information? Circle Item 46 on postcard, page 142.

New Compressor Line

A new air conditioning line for year-round and window cooler applications is being produced by Tecumseh Products Co., Tecumseh, Mich. The line includes air or water cooled hermetic compressors adaptable for year-round or furnace applications from 1½ to 5 hp and 2 and 3 hp air-cooled highsides.

Heading the line is a 5 hp full hermetic compressor for furnace air conditioning or self-contained applications. The Model FB500 is a four cylinder compressor which by a simple change of electrical components, may be used on either air or water-cooled applications. Charged with F-22, it will deliver full rated tonnage and under air-cooled conditions of 45 deg evaporator temperature, 95 deg ambient, 300 lb head and 77 suction pressure will produce 60,000 Btu per hr.

Five high back pressure models cover the range from 1½ to 3 hp. The two 1½ hp models are charged with F-12 and the rest are charged with F-22. All models are designed so that they may be used with either air- or water-cooled condensers by a simple change of electrical components.

All models incorporate the twin cylinder 180 deg opposed design and include many features.

Two air-cooled highsides have been established from the 2 and 2 hp highsides. They are charged with F-22 and provide full rated tonnage. For easier installation, all wiring is included in a control panel which includes the high-low pressure control, contactors, circuit breaker, and terminals for fan motor connections, evaporator blowers, ground and power connections. All external wiring is enclosed in BX cable and fan motors may be easily replaced.

A 1½ hp compressor is designed for all types of air-cooled 1½ hp applications. It is for larger window coolers and also smaller year around systems. An economy 2 hp unit has been made by increasing the bore of a 1½ hp model. The company's standard ¾ hp single cylinder compressors are newly designed to comply with the new codes and power factor requirements.

More information? Circle Item 47 on postcard, page 142.

Controls Temperature and Fan

The Perfex 480 far-limit control, designed for gas, coal, or oil fired systems, is announced by Perfex Corp., Milwaukee, Wis. The control has a factory set, single-pole, single-throw limit switch that prevents damage to installations due to excessive temperatures. Its limit lever system checks fan cycles.

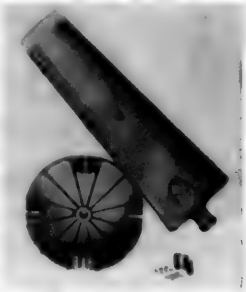
Both the fan switch and the limit switch are tested at 1800 volts. They have fixed differentials and are actuated by a single thermal element which can be furnished in various lengths and responds to temperature changes. The unit features a solid liquid fill, single stainless steel diaphragm actuator, for both fan and limit, fully enclosed switches, and summer settings for continuous fan operation.

The fan cut-out temperature is adjustable and set by a manual adjustment. Continuous fan operation is obtained by setting the fan temperature dial. This combination fan-limit control is of the remote bulb type and can be bent to avoid being actuated by reflecting or radiating surfaces in the furnace.

More information? Circle Item 48 on postcard, page 142.

Cooling Tower Fan Blade

Increased efficiency, strength and stiffness are said to result from a new blade design now used by Hartzell Propeller Fan Co., Piqua, Ohio, for Hartzite plastic cooling tower and heat exchanger fans made with 14 to 22 ft diameters.



These improvements are achieved by the use of a tapered blade which is considerably thicker at the shank than at the tip. A heavily reinforced leading edge increases stiffness and practically eliminates sag. Building up of the leading edge also produces a tear-drop cross section which smooths out air flow over the blades and produces increased air deliveries.

The plastic has been proved in numerous cooling tower and heat exchanger installations over the past 14 years as a material of exceptional strength and durability. It absorbs vibration and is highly resistant to corrosion and abrasion. If the surface of the blade is damaged, the interior has the same high resistance to corrosion and mechanical damage.

More information? Circle Item 49 on postcard, page 142.

Static Pressure Probe

A simple pressure probe intended for use with fluid manometers is announced by Flow Corp., Cambridge, Mass.

The instrument permits the measurement of static pressure in an air stream whose direction of flow is either unknown or fluctuates through a large angle. It will function over a flow-angle range of 65 deg or more and is designed to pass through a ¼-inch probe hole.

The probes are 18 inches long and have an outside diameter of either 0.134 or 0.25 inches.

More information? Circle Item 50 on postcard, page 142.

Packaged Air Conditioner

A redesigned self-contained water-cooled packaged air conditioner is announced for 1955 by Union Asbestos & Rubber Co., Chicago, Ill. The unit, known as the Royal-Aire, is equipped with a pump-down control system. This insures that a minimum of gas remains at low pressure in the coils when the machine shuts down, and means that less electricity is needed on starting.

All service connections are easily accessible. The blower section is constructed so that it can be used for either vertical or horizontal discharge and can be adjusted for either position by the installation man in the field.

Controls are located behind a push-in name plate at eye level to eliminate stooping or bending. The front panel of the unit is in three pieces with two return-air openings, one through the fluted area, the other a collar connection at the rear if duct operation is desired.

Fresh air connections are provided on both the right and left sides. The case is lined with ½-inch insulation to provide maximum thermal and acoustical insulating on all panels. It is bonded to the metal by mastic.

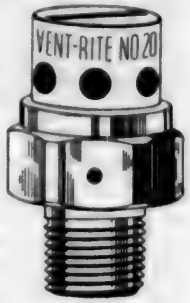
The unit is available in 3, 5, 7½, 10, and 15-ton capacities. Each unit has five-row cooling coils mounted in a vertical position to increase the dehumidification capacity. It can be provided with heating coils.

More information? Circle Item 51 on postcard, page 142.

Hot Water Venting Valve

An addition to its line of venting valves, the Vent-Rite No. 20, an automatic vent for hot water systems, is announced by Anderson Products, Inc., Cambridge, Mass.

The No. 20 positively assures automatic venting of hot water heating systems and constant, even heat all the time. It is simple and foolproof with no critical adjustments. Hygroscopic fiber discs automatically open to allow air to vent and then automatically close to prevent passage of water. The valve can be put on radiators, convectors, or radiant hot water systems and forgotten, so that costly service calls are drastically reduced.



When the radiator or convector unit is being filled, finger-tip control provides a means for extra fast venting by simply turning the cap. When a unit is being filled, water flows from a single vent hole to signal that it is full. The water may easily be caught in a container, so that there is no danger of water damage.

The valve is streamlined, with no sharp corners. It is compact and only 1 inch shows beyond the surface of the radiator. It is designed for pressures up to 50 lb psi.

More information? Circle Item 52 on postcard, page 142.

Collects Oil Mists from Air

The Electro-Staynew mist collector, for eliminating oil mist and smoke at its source, is announced by Dollinger Corp., Rochester, N. Y.

Designed to be mounted on or near high-speed grinding and cutting machines, the mist collector removes oil mist and smoke and returns clean air to the shop. Completely self-contained, the unit provides a packaged ventilating system for individual machine tools.

Oil-laden air is drawn in at the unit base and metal chips and abrasive material are screened. Mist particles are positively charged to +6,000 d-c in the ionizing section of the cell. Collector plates, negatively charged to —6,000 d-c, then attract and separate oil from the air stream. When oil accumulates on the plates in droplets heavy enough to resist the air stream, it drops off the bottom edge passing through the screen into a reservoir. From 2 to 6 gal of collected oil can be stored in the reservoir or piped back to the machine.

More information? Circle Item 53 on postcard, page 142.

Remote House Conditioner

The Marvair air cooled remote air conditioner Model 405-Z is a new addition to the line of Muncie Gear Works Inc., Muncie, Ind. It has two component parts, the condenser unit and the evaporator unit, to enable use of outside condenser location and an inside evaporator location. The condenser section is enclosed in a cabinet for inside or outside of the house installation, or in a garage, and is weatherproofed. The condenser unit has a large oversize air coil which gives excellent heat exchange performance even up to 120 deg outside temperatures.

The condenser-compressor assembly is housed in a water proof case so moisture will not be a problem. The compressor itself is housed in an insulated cabinet within the condenser cabinet which cuts down the sound level. All controls are housed in water tight housings within the condenser cabinet. Air is pulled through the condenser coil with a squirrel cage fan capable of 4000 cfm

The evaporator unit can be placed in a number of positions in the home. It can be used as a companion to the furnace, in the present duct work, in the attic with its own special duct work to the rooms, or through a drop ceiling arrangement. The evaporator is an oversize four coil assembly with sufficient primary surface for proper dehumidification and sufficient secondary surface for the absorption of heat from the air up to the capacity of the compressor.

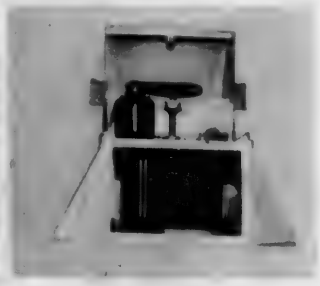
The condenser and evaporator are connected by a high side and low side copper tubing. These lines will be furnished and hooked up by the installing contractor in the field and the length of the tube is determined by the distance from the evaporator to the condenser unit. The condenser unit comes charged with 10 pounds of Freon-22, sufficient for a coupling of 60 ft of tubing.

At ASRE design conditions the unit has a capacity of 40,000 Btu per hr and at 95 deg outside, the capacity is still better than 36,000 Btu. It is listed as a 3 ton unit.

More information? Circle Item 54 on postcard, page 142.

3 Types of Power Ventilators

A line of power roof ventilators is announced by Airoflo Engrg. Co., North Hollywood, Calif. They are designed for use on commercial and industrial buildings for exhausting hot air, moisture, fumes, dust and all types of industrial waste air, winter and summer.



The ventilators are made in three types, propeller fan type, forward-curve centrifugal blower type, and backward-curve, non-overloading blower type. The forward-curve unit was designed to provide a streamlined, more compact unit that would have an improved appearance over utility sets that are now in use. They operate much quieter than the backward-curve units, due to their lower tip speeds.

All units are constructed of electrically welded angle iron frames, with an outer weather proof housing of heavy galvanized iron, treated with weather resistant paint. Motors and blower shaft bearings are of a standard make and are ball bearing grease packed for long life. All belt driven and direct connected blower units are designed with motors, drives, and bearings out of the air stream, and are in an accessible compartment for servicing.

More information? Circle Item 55 on postcard, page 142.

Underfloor Duct System of Clay

A heating duct system made of fire clay for underfloor heating service is introduced by Straitsville Brick Co., New Straitsville, Ohio. The system is being marketed under the name of Ceramiduct and consists of fire clay ducts, an assortment of fittings, and drawbands. It is manufactured in various sizes and shapes, including increasers, reducers, curves, ells, tees and wyes, and is delivered to job sites in one package, including necessary fittings and drawbands.

Installation is made by laying the ducts on tamped fill of gravel or crushed stone and then connecting the separate duct sections with drawband joints. Any accepted vapor barrier can be placed under the system extending under the entire floor surface. Concrete slab can be poured over the heating system in one pouring and the ducts do not have to be fastened to stakes or otherwise anchored before the slab is poured.

Ceramiduct has kerfed longitudinal grooves which can be knocked out to adapt registers of various sizes and dimensions. This feature permits the installation of registers in any location.

More information? Circle Item 56 on postcard, page 142.

New Radiant Electric Panel

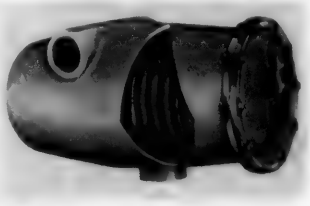
An electric heating element, fused in a special permatempered glass, which is said to produce a more durable and efficient radiant electric heating panel than has heretofore been available, is announced by Crystalite Co., Van Nuys, Calif. The company claims that the panel is seven times stronger than ordinary glass and assures an instantaneous, even flow of heat to all parts of the plate through an element permanently fused with the glass. A coating on the back of the plate provides additional reflectivity and prevents electrical leakage from the element.

More information? Circle Item 57 on postcard, page 142.

Heater Features New Valve

An improved model of the T-series tankless water heater is introduced by Alstrom Corp., New York, N. Y. A new feature of the model is the built-in manual tempering valve.

The tempering valve is built into the removable, cast-bronze, convex head of the water heater. It can be adjusted for summer or winter control of hot water temperatures and does not create a pressure unbalance which may be noisy and difficult to control. The valve is preset at the factory for normal operating conditions.



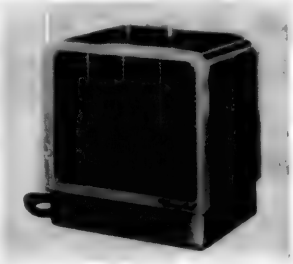
Should a special case arise where the by-pass must be regulated, a twist of the valve will give control over the cold water, thereby tempering the hot water.

The new model heater has less pressure drop than previous models because of its helically-wound coil. It is equipped with ⅝-inch copper tubing, a self-flushing sludge chamber, an aquastat opening and two inlet tappings for right- or left-hand installation. Also the cast-iron shell has been made larger to achieve a more balanced flow over the coil. The units are hydrostatically tested and have hot water capacities of 4 and 5 gpm for 2 to 4 baths.

More information? Circle Item 58 on postcard, page 142.

Portable Room Cooler

A portable room cooler, the CarryCool, for home or office use has been developed by Utility Appliance Corp., Los Angeles, Calif.



The cooler, which can be plugged into any electrical outlet, has a built-in water pump and a 12-inch fan powered by a 2-speed electric motor. It also has matching plastic louvers on front and rear so that it can be used as an exhaust fan and, in winter, as a humidifier. Its disappearing handle makes it suitable for use as both a permanent and portable room fixture.

The unit weighs 27 pounds, is 17½ inches high, 17 inches wide and 13½ inches deep.

More information? Circle Item 59 on postcard, page 142.

Rigid Plastic Pipe

After a year of development work, Easton Plastic Products Company, Inc., has gone into full production of rigid plastic pipe at its Easton, Pa., plant. The pipe is low-cost, highly corrosion resistant, and held to close tolerances in concentricity and wall thickness. The pipe is made of B. F. Goodrich Geon in both normal and high impact varieties.

It is available through industrial distributors throughout the country in all standard pipe sizes from ¼ to 2 inches. The pipe can be threaded and is used with rigid PVC fittings sold by the company. Prices for normal impact varieties range from 15 cents per foot for ¼ in. size to $1.52 for the 2 in.

The company is presently developing 3 and 4 inch pipe and anticipates production of 6 to 8 inch sizes later.

More information? Circle Item 60 on postcard, page 142.

Cleans Air Electronically

An electronic air cleaner, the Dustronic, that can be attached to a forced air furnace, has been developed by Radex Corp., Chicago, Ill.

A series of mechanical and electrostatic filters inside the unit trap airborne dirt.

The air passes through a mechanical filter which captures and holds the larger derivatives of plant, mineral, or animal origin. The air is then directed by a baffle, and the finer particles, that may evade the mechanical plates, pass through multiple electrostatic collector plates. Each particle is charged and attracted toward an oppositely charged plate.

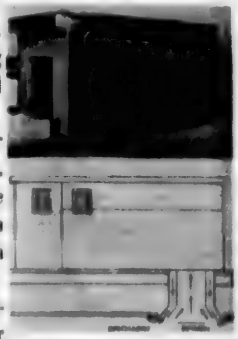
Due to the design of the collector plates, the turbulent flow of air insures the retention of undesirable elements in the air. The collector plates are coated with an adhesive solution which holds such harmful agents as germs, viruses, and pollen, until they are inactivated; the plates can then be washed and recoated. The cleaner is also flameproof and will not produce ozone gas.

This electronic device is considered an aid to victims of hay fever, asthma, and other allergies who suffer from airborne irritants.

More information? Circle Item 61 on postcard, page 142.

Small Rooftop Air Conditioner

A rooftop commercial air conditioner, the Alco Airmaster, is being made by Alco Refrigeration, Inc., Cleveland, Ohio. The unit is designed for cooling and heating one-story industrial and commercial buildings.



The entire installation of the air conditioner is made on the roof. The only inside evidence of the unit is a single opening, made in the ceiling, for the combination air-diffusion and return.

No extensive duct work is needed nor are plumbing hookups or drains, for the unit is air-cooled. The elimination of long duct-runs does away with heat leakage and requires less electrical power. In multiple unit installations, each unit is actuated by its thermostat for zone-temperature control.

More information? Circle Item 62 on postcard, page 142.

Switch Is Redesigned

An adaptation of standard Bulletin 920 remote control switch is announced by Automatic Switch Co., Orange, N. J.

This switch is now available with a control line fuse and adapter. The adapter may be purchased as a separate item and added to an existing remote control switch. The adapter may also be obtained as an integral part of a new switch. Bulletin 920 remote control switches are Underwriters' Laboratories approved to 600 volts a-c, 250 volts d-c. These switches provide accessible and convenient control lighting and power circuits. They may be actuated by push buttons, timers, toggle switches, or similar devices. The switches are designed for simple, low cost installation on panel boards and switchboards, and for separate installation on sub-panels.

More information? Circle Item 63 on postcard, page 142.

Vent-Drain-Bleeder Valve

A stainless steel Graloc vent-drain-bleeder valve, in sizes ½ and ¾ inch, has been designed for 20,000 psi safe working pressure or temperatures up to 1200 deg., by the maker, Gray Tool Co., Houston, Tex.

A pressure-aided seat makes it leakproof for oil, water, gas or steam service. It is fabricated from a combination of types 410 and 416 stainless steel, making it suitable for essentially any fluid or atmosphere, and providing a maximum resistance to galling.

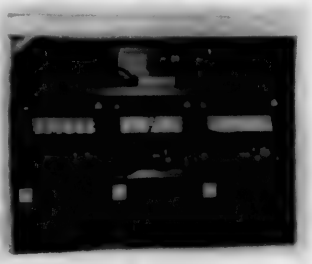
It may be used for vents and drains at the high and low points of piping, equipment and instruments, to bleed at double block valves, and as freeze drains, try-cocks and sample connections.

More information? Circle Item 64 on postcard, page 142.

One Pipe Year-Round System

An all-water year-round air conditioning package for homes that provides heating and cooling using a simple one pipe system is introduced by Brown Products Co., Forest Hills, N. Y.

A remote unit is placed in the room to provide heating or cooling. Air is cleaned by filters and is discharged into the room by multi-speed blowers after passing over coils through which hot water circulates in the winter and chilled water during the summer. The room units are installed on a one-pipe system almost identical with the conventional monoflow forced hot water system used with convectors. A conventional hot water boiler is used during the winter.



Chilled water for summer operation is supplied by an air cooled water chiller shipped as a factory sealed unit. It requires only simple piping and electrical connections. It is charged with a refrigerant in the factory.

The air cooled water chiller is available in 2 and 3 hp capacities with two 1 hp compressor assemblies in the 2 hp size and three 1 hp compressor assemblies in the 3 hp size. Each 1 hp assembly is thermostatically controlled, thus permitting automatic step operation at partial loads.

The conditioner has an extremely low pressure drop for water flow comparable to that of conventional convectors. Thus it can be installed on a monoflow system using a water circulating pump similar to that in residential radiator heating systems.

During the cooling cycle the water circulating pump of the system should operate continuously. The blowers in the air conditioner room units should operate at high speed until the controlling room thermostat is satisfied, then they switch automatically to low speed. In this way continuous dehumidification is obtained.

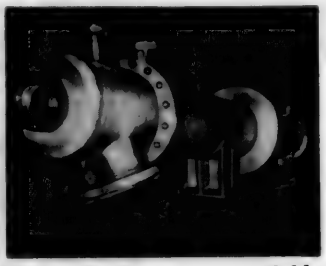
In the air cooled water chiller, each 1 hp compressor assembly, being thermostatically controlled, will cut in if the water temperature reaches the preset value. If a smaller number of compressor assemblies can maintain the water temperature low enough the remaining compressor assemblies will not operate, thus giving a partial load operation resulting in power saving.

More information? Circle Item 65 on postcard, page 142.

Semi-Standard Heat Exchangers

A new line of semi-standard heat exchanger units designed to meet a wide variety of heat-transfer problems is announced by Downingtown Iron Works, Inc., Downingtown, Pa.

Production has been set up to provide shipment of these units within two or three weeks, the manufacturer states, and yet numerous optional design features may be specified. The nozzles, for example, may be of any size or in any location required by the installation. Units may be specified with or without an expansion joint. The semi-standard units are available in stainless steel or carbon steel. Other alloys are also available, though they may require a longer time for delivery.



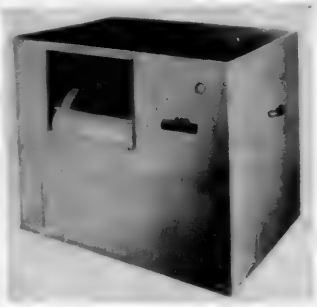
The semi-standard heat exchangers are said to be built to the same high standards of quality followed in fabricating custom-built heat-transfer equipment at Dowingtown. Thickness of the tube sheets is ⅞-inch and up, and thickness of bonnets and channels is 3/16-inch. Small stainless steel nozzles are schedule 40 stub ends, with ASA lap-joint flanges. The units have been designed for pressures of 150 psi and higher, and construction details meet ASME Code specifications.

Standard shell diameters available are 5, 6, 8, 10, 12, 14 or 16 inches, in various lengths in each size. Construction may be 1 pass, 2 pass or 4 pass, and tube diameters may be ⅝, ¾ or 1 inch.

More information? Circle Item 66 on postcard, page 142.

Air Conditioning for Homes

Two types of equipment designed to meet a wide variety of central cooling needs for homes, are announced by United States Air Conditioning Corp., Minneapolis, Minn. The firm now has in production an air-cooled condensing unit, and a residential heating and cooling combination unit.



The Kooler-aire air-cooled condensing unit (shown at right) can be utilized to convert a warm air heating system to all-year air conditioning when used in conjunction with a direct expansion coil which can be installed at any point in the air supply system. Used with a coil and blower assembly it can provide cool air to a duct system. The condensing unit combines a sealed hermetic motor-compressor which is suction gas cooled, a four-row condenser coil with copper tubes and aluminum fins, a welded steel receiver with a pressure relief for safety, and a blower with forwardly curved wheel and variable pitch V-belt drive. It is housed in a heavy steel cabinet with weather-resistant baked enamel finish. The evaporator capacity of the 2-ton unit varies from 2.09 with a 75 deg ambient temperature to 1.71 tons at 115 deg. The 3-ton model ranges from 2.95 tons at 75 deg to 2.47 at 115 deg.

The combination summer-winter unit (shown at left) cools, heats, filters, dehumidifies and circulates the air, using a single duct system to distribute both warm and cool air throughout the house. Desired temperature is maintained automatically by a heating-cooling thermostat. For summer operation, a by-pass damper prevents the continuous flow of cool air over the heat exchanger, to prevent condensation and rust formation in the furnace. All air is filtered through permanent filters which are removable for cleaning. The equipment can be installed in the basement, utility room or closet. All units have the same outside dimensions, 44 inches wide, 37 inches deep and 57 inches high.

More information? Circle Item 67 on postcard, page 142.

Treats Air for Allergies

P-5, a non-toxic, non-irritating chemical which, when introduced into the air, has desensitizing properties which prevent allergies, is announced by Phillips Scientific Laboratories, Arlington, N. J. It is available on franchise agreement through original equipment manufacturers.

One method of using the chemical is to treat the air filter used in the home or industrial air conditioning system with the substance, or if a humidifier is used, the chemical can be made water soluble and added to the water.

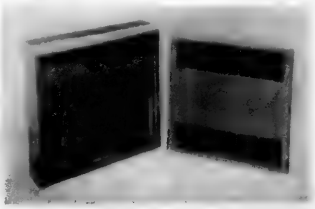
In industrial plants where neither air conditioners nor humidifiers are used, absenteeism due to allergy producing elements can be cut by installing large aluminum perforated panels containing the chemical.

The company has treated wool and other fibers with the result that persons who could not wear garments of these fibers without itching, have been able to do so after the material was so treated.

More information? Circle Item 68 on postcard, page 142.

Convector Has Thermostat

Electric convectors with a thermostat control and two heat ranges are being produced by Electrovector, Inc., Brooklyn, N. Y. The convectors are designed to operate on one-half their full capacity, thereby affording low intensity heat during moderate weather and high intensity heat during colder weather.



The heaters are constructed of steel fins bonded to seamless steel tubing and are available in wall cabinets (upper photograph) or base board covers (below). Six cabinet models are made that draw from 1,000 to 2,000 watts and produce from 3,412 to 6,824 Btu per hr. The two base board models both draw 2,000 watts and produce 6,824 Btu per hr; they differ only in their voltage and amperage ratings, one drawing 115v and 17.4amp, the other 230v and 8.7amp.

Both type convectors are intended for use in homes, schools, hospitals, and larger commercial and industrial buildings. The cabinet type, which is 24 inches high and 5 inches deep, is made in 24½-, 36½- and 48½-inch lengths and all base board types are 6-11/16 inches high, 2-5/16 inches wide and 8 ft 1½ inches long.

More information? Circle Item 69 on postcard, page 142.

Two Cooling Tower Styles

Two styles of cooling towers are announced by Halstead & Mitchell, Pittsburgh, Pa.

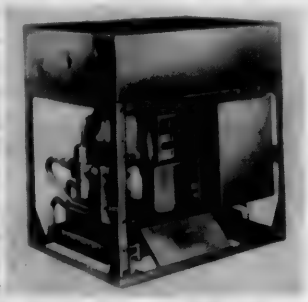
One of the towers, called the Take-Apart, is designed to be dismantled for installation in difficult places. Because of this feature, it can be moved to rooftops without the aid of riggers, or can be taken down narrow stair wells for basement installations.

The other style tower features centrifugal fan units, to be used with cooling towers where quieter operation is necessary. The fans are made of stainless steel and three specific protections are used on the sheet steel cabinets, namely, vinsynite, vinyl zinc, and chlorinated rubber. All of these paints are hydraulically applied.

More information? Circle Item 70 on postcard, page 142.

Chiller for Air or Water

A liquid chiller, the WC Coolrite, equipped with either air or water cooled condensers, has been introduce by Cool-Ette, Inc., Detroit, Mich. The units are manufactured in 2, 3 and 5 hp sizes with all components assembled within a steel frame measuring 23¼ inches wide, 17¾ inches deep, and 26⅛ inches high. They are made for 220 volt, 60 cycle, single phase or 220 volt, 60 cycle, three phase operation.



The chillers may be used in combination with a hot water boiler and convector units to produce year-round air-conditioning with a forced hot water heating system in homes and small commercial establishments. They may be also used as sweet water or drinking water chillers.

The chillers are equipped with all necessary devices to protect them against freezeup of the evaporators and overpressures, as well as to protect the motors against overloads. The hermetically sealed compressor, together with the other components, are factory assembled, piped, wired and tested to assure minimum field service.

More information? Circle Item 71 on postcard, page 142.

New 15 Hp. Scotch Boiler

Specifying Eclipse boilers to power requirements for commercial and industrial applications is now even more exact with the addition of a 15 hp series which has been added to its line of automatic Steamboilerplants by Eclipse Fuel Engrg. Co., Rockford, Ill. The new model is available for burning gas only, oil only, or gas and light oil.

Over-all dimensions are: length, 160 inches, width, 44 inches, height, 61 inches. Completely assembled, the new boiler is ready for immediate operation after electricity, steam, water, fuel, and stack are connected. All necessary wiring is complete. Equipment includes burners, blower, combustion safeguards, and all necessary valves and controls.

More information? Circle Item 72 on postcard, page 142.

Extra-Small Pilot Controller

A thermostatic pilot controller, unusually small in size and rugged in construction, has been developed by Fulton Sylphon Div., Robertshaw-Fulton Controls Co., Knoxville, Tenn.

The controller, measuring 3-13/16 inches in width, provides accurate temperature control of liquids or air when used in conjunction with valves, dampers, and other controls. It is readily employed in control systems of tanks, chemical vats and processes, instantaneous water heaters, and other applications in which rapid response and adjustable control characteristics are required.

The new instrument, called the Fultrol pilot, is installed at the location where temperature is to be maintained. The extremely sensitive rod-and-tube thermal element of the instrument is immersed directly in the medium being controlled. Because of its unusual construction, the new controller may be installed in any position, vertically, horizontally, or diagonally.

Any change in temperature at the thermal element activates a small pilot valve, which in turn varies the control pressure applied to a motor valve or any other final control device. The pilot is modulating in action. Operation of the final control device governs the amount of cooling or heating applied to the medium under control.

More information? Circle Item 73 on postcard, page 142.

Heavy Duty D.C. Motors

A complete new line of industrial direct-current motors is introduced to industry, the Super T line motors developed by Reliance Electric and Engineering Co., Cleveland, Ohio. These new motors are described as producing the fastest and most accurate response ever offered in a standard designed motor.

A feature of the motors is Dynamic Response, described by the maker as the fundamental, yet spectacular feature that has been built into the motor to meet industry's growing demands for automation. The design features of ruggedness, ability to take full load and overloads, ability to change speed rapidly, ability to maintain torque and tension, and reverse and stop quickly are most significant.

The motors are being produced in sizes from 20 to 100 hp, and the range will be extended both upward and downward to higher and lower horsepowers.

More information? Circle Item 74 on postcard, page 142.

Step Starter for Home Coolers

A step starter, designed for home air conditioners of three or five horsepower, is announced by General Purpose Control Dept., General Electric Co., Schenectady, N. Y. The company claims that the starter breaks the starting voltage drop into two steps, reducing the light flicker that usually occurs when large, home air conditioners are turned on.

The step starter inserts a resistance in series with the motor for approximately two seconds. After two seconds the timing relay energizes the coil of the contactor, shorting the resistor and applying full voltage to the motor. This reduces the current on the first step and reduces the initial voltage drop which causes light flicker. When the resistor is shorted out, a second increase in current results to start the motor, but decreases as the motor gains speed.

More information? Circle Item 75 on postcard, page 142.

(*Continued on page* 135)

St. John The Baptist Church

Rome, N. Y.

Architect: FRANK W. BRODRICK, Syracuse, N. Y.
Engineer: MALCOLM B. MOYER, Syracuse, N. Y.
Gen. Cont.: JAMES PAOLINI CONST. CO., INC., Syracuse, N.Y.
Heat Cont.: O'SHEA SUPPLY CO., INC., Rome, N. Y.

ANOTHER CASE OF COPPER WHERE IT COUNTS

The beauty of heating a church by radiant panels is that traditional as well as modern architectural design may be used without having to make allowances for outlets or radiators in your design. It is the number one method of heating churches and similar permanent structures. And, when installation is completed panels are invisible. Also, when Revere Copper Water Tube is used it is easily and readily installed, easy to bend, requires no thread cutting and the solder or compression fittings used are readily made. There are fewer of these fittings and they are tight, trouble-free fittings when finished.

A radiant panel heating system of Revere Copper Tube is a long-lasting one, too, which is mighty important in a permanent structure such as a church. For copper tube cannot rust, its endurance has been proved for centuries.

So never mind what the other fellow says . . . *you* keep out of trouble with copper. Use Revere Copper Water Tube for radiant panel heating, hot and cold water lines, underground service lines, processing lines, waste stack and vent lines. Your Revere Distributor has plenty of stock these days, in all the required sizes.

IN THE LARGE PHOTO ABOVE NOTE THE NEAT LAYOUT, the even, easily-bent lengths of Revere Copper Water Tube, the few number of fittings . . . only every 60' in the panels. 5,000 ft. of tube was used in sizes ranging from ¾" to 1⅓". The architect and contractor tell us that the suggestions made by one of Revere's Technical Advisors were most helpful in both the planning and installation stages. Why don't you take advantage of this service? No obligation, naturally.

REVERE

COPPER AND BRASS INCORPORATED

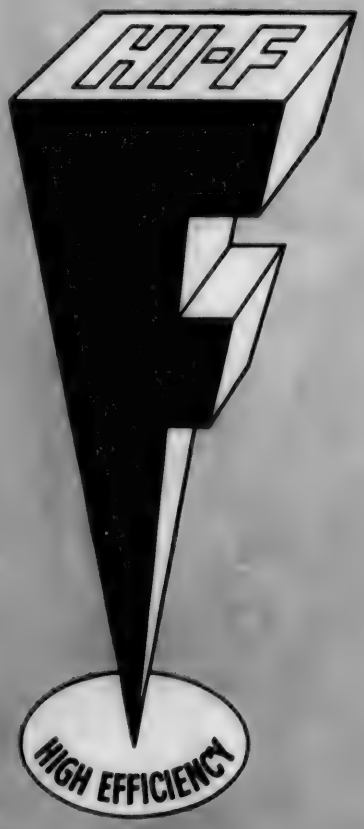
Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

• • •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N.Y.—Sales Offices in Principal Cities, Distributors Everywhere.

Announcing . . . Hi-F (High Efficiency)



FINNED COILS FOR REFRIGERATION AND AIR CONDITIONING

Hi-F, a new name in copper and aluminum finned coils, is going to influence your sales and profits in 1955.

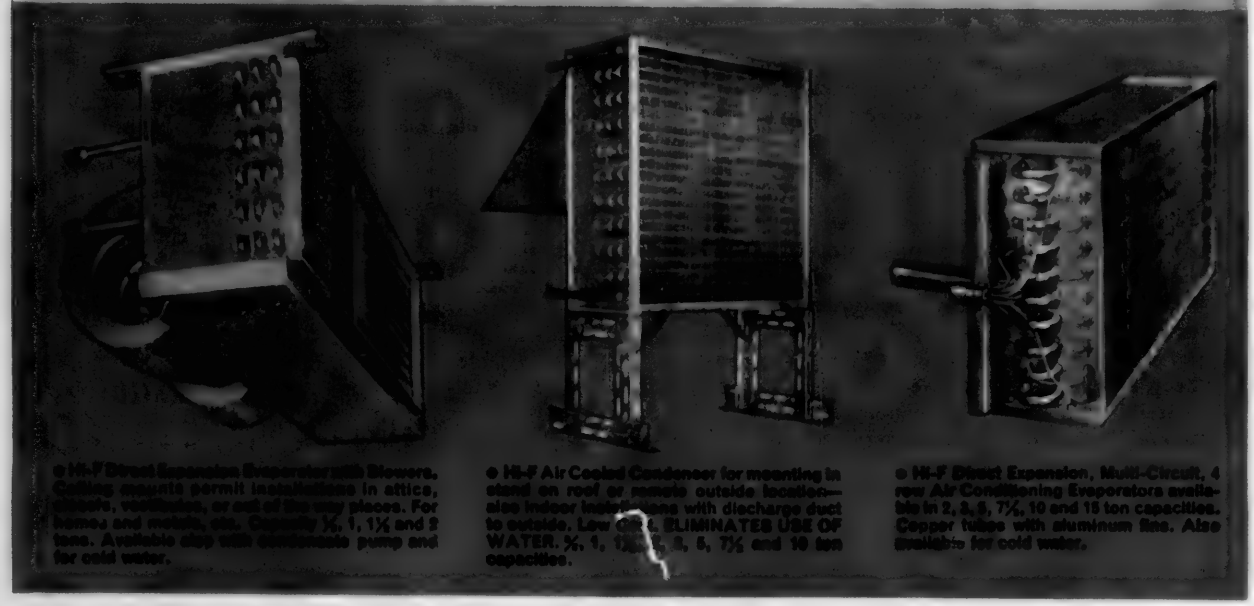
Hi-F finned coils, used either for evaporators or condensers, are made by automatic machinery in entire sections. An exclusive patent-applied-for Peerless process brings you all the advantages inherent in mass production, plus an unsurpassed efficiency, due to the superior bond between coil and fin.

In our new modern plant, production schedules for any manufacturer or contractor can be made on a delivery-on-time basis.

Illustrated are a few of the more popular types of Hi-F coils for air conditioning described in our new bulletin which is yours for the asking.

MANUFACTURERS, NOTE—*Send us blue prints of your evaporator and condenser requirements for a Hi-F quotation. Please indicate delivery requirements.*

PEERLESS OF AMERICA, INC.
5830 N. PULASKI ROAD, CHICAGO 30, ILLINOIS, U.S.A.



• Hi-F Direct Expansion Evaporator with Blowers. Ceiling mounts permit installations in attics, closets, ventilators, or out of the way places. For homes and markets, etc. Capacity ½, 1, 1½ and 2 tons. Available also with condensate pump and for cold water.

• Hi-F Air Cooled Condenser for mounting in stand on roof or remote outside location—also indoor installations with discharge duct to outside. Low cost. ELIMINATES USE OF WATER. ½, 1, 1½, 2, 3, 5, 7½ and 10 ton capacities.

• Hi-F Direct Expansion, Multi-Circuit, 4 row Air Conditioning Evaporators available in 2, 3, 5, 7½, 10 and 15 ton capacities. Copper tubes with aluminum fins. Also available for cold water.

(*Continued from page* 132)

Coolers Have Hideaway Feature

Room air conditioners featuring the hideaway installation and combining long life expectancy with quiet, high capacity operation and a handsome range of colors are announced for 1955 by Carrier Corp., Syracuse, N. Y. At the same time, suggested retail prices will be reduced by $40 to $60 from last year's prices. Three colors will be offered for 1955—glacier grey, colonial white, and suntan.

The unit can be hung at the top of a window, brought all the way inside the room, with only the back of the unit in the window opening, or suspended in a basement window. It can be installed against casement windows without cutting the mullions. Photo shows unit built into exterior wall with only the grille showing inside the room.

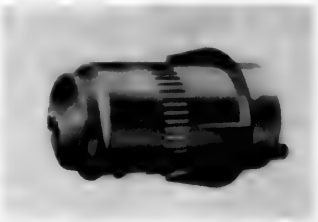
Since protection against corrosion at both seashore and city locations is one of the most important single factors in determining the life of a room air conditioner, casing and structural elements of the new units are made of steel coated with a layer of zinc. It is then bonderized and painted, giving the unit a long life expectancy.

More information? Circle Item 76 on postcard, page 142.

Vacuum Burner Saves on Fuel

A vacuum burner said to effect large fuel savings through the use of a special vapor injection process in the combustion chamber is placed on the market by Utah Hydro Corp., Salt Lake City, Utah.

The burner is actually an improved version of the principle of using steam superheated tubes in a combustion chamber, and the result is a superheated gaseous vapor which atomizes the fuel through special jets. The firing takes place within the same combustion chamber. The manufacturer states that pressures, catalytic actions, and vacuums within the tubes play an important part in the hydro combustion. It is claimed that while the unit effects substantial savings in fuel consumption using standard fuels, additional savings can be made possible through the use of heavier, less costly grades of oil. The oil burner performs equally well when burning heavy or light oils, but offers the greatest savings in fuel cost and achieves maximum efficiency through the use of less expensive, rich-in-carbon, heavy residual fuel oils.



Manual control valves are standard equipment, with a modulation control regulator which proportions the oil and steam supply to all jets simultaneously and gives uniform flame on all firing ranges from low right on through intermediate to high heat capacity. In most cases, many of the automatic devices on present burning equipment may be adapted for use with the hydro vacuum burner. Most of the oil storage, pumping and heating systems now installed can be used with minor changes.

More information? Circle Item 77 on postcard, page 142.

Electronic Smoke Indicators

Smoke indicators for use on coal furnaces, oil burners, and incinerators are being produced by De-tec-tronic Corp., Chicago, Ill.

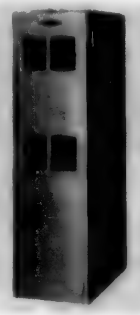
One model, the 300-P90 has an adjustable automatic control for secondary air streams injected by either turboblower or venturi steam jets. The other model 300-P85, provides audible or visual signals, or both, only during periods of excess smoke, for warning firemen to take corrective measures.

Both models are equipped with a smoke density meter calibrated in Ringelmann units and a selector switch for relay operation at desired Ringelmann gage smoke densities from 1 to 4.

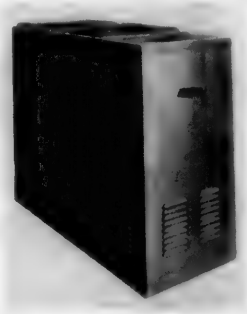
More information? Circle Item 78 on postcard, page 142.

Gas, Oil Furnaces, Conditioners

Officials of the newly-formed Ingersoll Conditioned Air Div., Borg-Warner Corp., Chicago, Ill., have announced plans for a major expansion of the company's operations in the heating and air conditioning industries. The new division's plant in Kalamazoo will produce for 1955 a new line of gas-fired warm air furnaces from 70,000 to 200,000 Btu per hour input in high-boy (top view), low-boy, counter-flow, and suspended models.



The gas-fired line is built around a sectional heat exchanger with a built-in draft diverter and fully enclosed controls. Proof of the rugged built-in quality of these units is the 10-year heat exchanger warranty offered to the purchasing public.



The smaller units will be available with either direct drive or belt-driven blowers. The furnace line has been livened with a selection of two-tone colors.

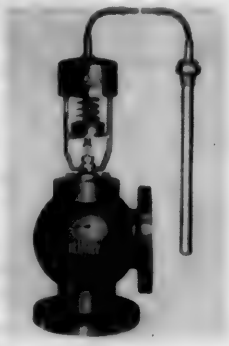
The newly-designed oil-fired furnaces (bottom photo) range in sizes from 80,000 to 165,000 Btu per hour bonnet delivery. These units are also available in high-boy, low-boy, counter-flow and suspended models and in new colors. Many improvements are being offered in both the burners and the furnaces. These completely factory-wired compact units can be installed in the smallest of utility rooms.

Air conditioners, both air-cooled and water-cooled, will be available as companion pieces in 2, 3 and 5 ton sizes. Gas and electric water heaters and incinerators also will be merchandised.

More information? Circle Item 79 on postcard, page 142.

Angle Temperature Regulator

A line of angle Type T temperature regulators has been developed by O. C. Keckley Co., Chicago, Ill. The regulators may be mounted directly on heat exchangers, instant water heaters, and similar equipment, that have inlet connections on the top.



The regulators have wearing parts of stainless steel or bronze that can be renewed. The regulator has an over-run feature for protection of the thermal element in the event temperature at the bulb exceeds the range of the regulator. A two-ply bellows is used in the thermal unit for added power and longer life. The body is bronze or semi-steel. All trim is either bronze or stainless steel. The unit is available with screwed connections in sizes from ½ to 2 inches and with flanged connections in sizes from 2 to 8 inches. All ½ to 4-inch sizes are spring loaded and all sizes from 6 to 8 inches are weight loaded.

More information? Circle Item 80 on postcard, page 142.

1955 Room Air Conditioners

Two lines of room air conditioners, built with increased cooling power, and designed for flush mounting as one of 23 possible installed positions in double-hung or casement windows, are introduced by Amana Refrigeration, Inc., Amana, Iowa.

The year-round models, in ½, ¾, 1, and 1½ hp sizes, are claimed to deliver more cooling because the condensers have been increased in size up to 33%, and the evaporator by as much as 50%. Any one of six combinations of cooling, heating, dehumidification and ventilation may be selected by adjusting a single glider control located across the front of the unit. The necessary switching of dampers, compressor, and fan is accomplished automatically once the control is set. Available with a tan or ivory front, both with gold trim, the year-round models contain a heating unit for use during late evening or fall chills.

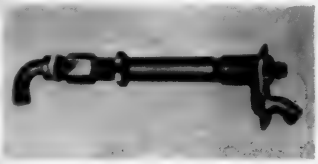
The De Luxe room air conditioners (shown), lower priced for the volume market, come in ½, ¾, 1, and 1½ hp sizes. Capable of delivering cooling, ventilation and dehumidification, they are also built with large evaporators and condensers. With these units, the desired indoor temperature may be selected by adjusting a switch knob and a slide control. The cabinets of the De Luxe models are brown with gold metal trim.

All models in both lines will fit any opening more than 25 inches wide and 15 inches high. They include a standard installation kit for double hung windows 26 to 48 inches wide. Also available are special kits for wide windows and casement windows, adjustable floor supporting legs, and an inside mounting kit which allows the window to be closed or opened for washing. All units are 15 inches high, 25 inches wide and 34-15/16 inches deep except the 1½ hp models which are about 1½ inches higher at the rear, to permit greater air discharge. Other features common to both lines include a larger air outlet which distributes a greater volume of air quietly and at low velocity, finger tip adjustable air deflector which directs air in any direction to prevent drafts, and a hermetically sealed refrigeration system. All models have a removable viscous-coated fiberglass air filter. Both lines are built to operate on standard electrical circuits according to terms of the new National Electric Code.

More information? Circle Item 81 on postcard, page 142.

Non-Freezing Wall Hydrant

A new heavy duty non-freezing wall hydrant, Model JK, for commercial and industrial applications, has been announced by James Knights Co., Sandwich, Ill., as a new addition to its line of non-freezing residential wall faucets, and ground hydrants.



The hydrant is built to meet government specifications, is threaded for standard hose couplings, and is supplied with a union elbow coupling with metal to metal seat and a ¾-inch male pipe thread inlet. The standard head is either polished brass, plain nickel, or polished chromium and has a ⅜-inch brass valve rod. The castings and operating parts are brass; the pipe and lock nut are galvanized.

The hydrant is available in lengths of 6 through 24 inches.

More information? Circle Item 82 on postcard, page 142.

Hot Water Expansion Regulator

An expansion regulator, for the improvement of hot water heating systems, is announced by American Tube Products, Inc., Natick, R. I. The regulator is an expansion tank with a diaphragm that keeps air from coming into contact with the boiler water.

Before the regulator has been connected to the boiler with a length of small diameter copper tubing, it is precharged with air. The system is first manually filled to approximately 15 psi. After bringing the system up to operating temperature, the radiation is manually vented and the pressure readjusted.

As the system heats and the water volume increases, the water moves into the regulator against the diaphragm. As the water cools and decreases in volume, the diaphragm pushes the water back into the system thereby maintaining the required pressure.

The regulator can be installed in any position and does not have to be installed on the ceiling of low-studded basements.

More information? Circle Item 83 on postcard, page 142.

(*Continued on page* 138)

Halstead & Mitchell

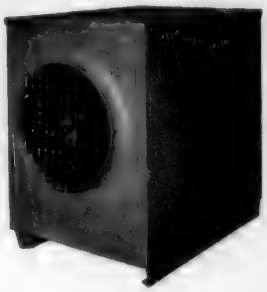
for LONG LIFE PROTECTION

COOLING TOWERS

with the exclusive

20-Year Guarantee!

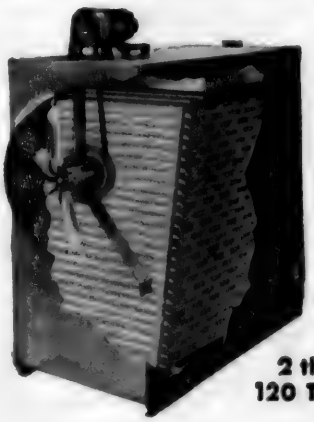
on the wetted deck surface against rotting or fungus attack



YOU ARE GUARDED WHEN YOU CHOOSE A HALSTEAD & MITCHELL RESIDENTIAL OR COMMERCIAL TOWER

Only Halstead & Mitchell can offer a 20-Year Guarantee on the wetted deck surface against rotting or fungus attack because only Halstead & Mitchell creosotes cooling tower wood. No other material, subject to deteriorating or rusting, can be so guaranteed.

Stainless steel fans, sheet steel cabinets hydraulically painted with vinsynite, vinyl zinc and chlorinated rubber . . . add to this protection for the longest life. There's no extra cost for these extra protections . . . just extra long time benefits on the job.



2 thru 120 TONS

CONDENSERS

with economical

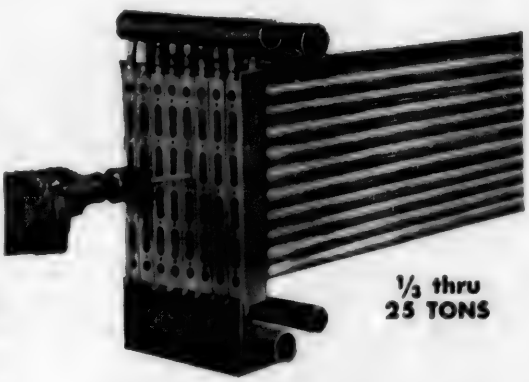
Lifetime Cleanability

for always-new efficiency

The cooling tower you select works with a condenser, and here again you are guarded by Halstead & Mitchell.

CLEANABILITY in a water-cooled condenser costs no more, but troubles from poor water conditions vanish. Heat transfer efficiency is maintained at new unit levels for life, for a simple mechanical cleaning tool restores heat transfer surfaces in minutes.

Regardless of whose condensing unit you buy, do what almost all leading manufacturers have done—specify CLEANABILITY. It's your most important protection . . . why settle for less?



⅓ thru 25 TONS

AT LEADING HEATING AND REFRIGERATION WHOLESALERS EVERYWHERE

Write for Detailed Specifications

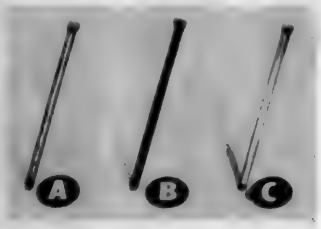
HM Halstead & Mitchell

BESSEMER BUILDING • PITTSBURGH 22, PA.

(*Continued from page* 136)

Oil Sludge Solvent Stops Rust

A fuel oil additive that dissolves sludge, disperses water and prevents rust, has been developed by Montgomery Chemical Co., Jenkintown, Pa. Known as Sludge Solvent 32, its primary purpose, is to dissolve sludge but, in addition, it emulsifies water which gets into the oil by condensation and by accident.



The emulsifiers used are especially selected not to promote wetting of the tank by the water, but rather to promote wetting of the tank by oil, thus keeping the water away, and so preventing rust. Use of the solvent causes any water present to be emulsified in the oil and kept out of contact with the metal of the tank.

The accompanying photo shows three wire nails from corrosion tests run with sludge solvents. Nail A was from a test with a standard type sludge solvent, nail B from a test with an emulsifier type solvent which displaced oil, thus wetting the metal with water, and nail C was from a test with Sludge Solvent 32 which displaced water, and prevented rust entirely.

More information? Circle Item 84 on postcard, page 142.

For Home or Business Use

The addition of a 5-ton capacity packaged model to its line of air conditioners is announced by Aug. G. Barkow Mfg. Co., Inc., Milwaukee, Wis.

The unit is for both residential and commercial application. Though self-contained, it is also available without plenum and fan for use with existing heating systems and can be equipped with steam coils.

Known as the F5K, the furnace model, and the C5K, the commercial model, the units feature 1 and 3 phase hermetic compressors, counter-flow cleanable type condensers, aluminum fin evaporators with copper tube capillary system, and cooling-heating type switch controls suitable for remote installation and for use with standard thermostats.

More information? Circle Item 85 on postcard, page 142.

Blower for Corrosive Air

A 14-inch tubeaxial blower of unplasticized polyvinyl chloride for expelling corrosive air, fumes and gases is being manufactured and marketed by Industrial Plastic Fabricators, Inc., Norwood, Mass.

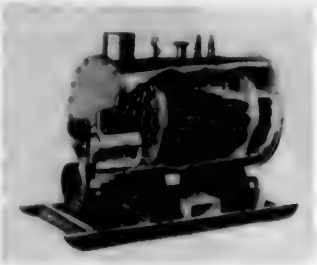
The all-plastic impeller blade of the blower has a spinner cap that is claimed by the manufacturer to be aerodynamically balanced for smooth, vibrationless operation at high speeds. The drive shaft, pulley, belts and sealed bearings are totally enclosed. The blower may be installed vertically or horizontally. The 14-inch model has a ¾ hp motor, 3-phase, or single phase on request, mounted on a steel pedestal. A protective coating may be applied to the steel pedestal if required by the presence of a corrosive atmosphere. The tubeaxial blower is manufactured in a range of sizes from 14 inches up.

The Model Ta-14 tubeaxial blower has a range from 260 cubic feet of air per minute at 875 rpm with a static pressure of .025, maximum restriction of .150 S.P., to 2400 cfm at 2500 rpm with an S.P. of 280, and a maximum restriction of 1.30 S.P. The brake horsepower is from .010 to .757, respectively.

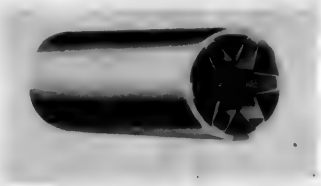
More information? Circle Item 86 on postcard, page 142.

Boiler Uses Finned Tubes

The advantages of extended surface finned tubes, used for heat transfer in chemical and petroleum industries, are applied to transferring heat in a boiler (top view) produced by Brown Fintube Co., Elyria, Ohio.



As illustrated in the lower photo, the internally finned tubes produce a fire-side to water-side surface ratio of about 3 to 1, as compared to a fire-side to water-side ratio of only 1 to 1.1 for plain bare tubes. Thus the internally finned tubes provide almost 3 1/3 times more surface area than plain bare tubes to pick up the heat and transfer it to the water. In addition, the internal finning increases the turbulency of hot gases, and brings them into greater contact with the heat transfer surface than is possible in a plain, bare tube.



The increased fire-side surface, and the greater contact of hot gases against the surface, permits a maximum amount of heat to be extracted from the hot gases in one pass through a relatively short, finned tube. This permits the construction of a compact boiler, and reduces the forced draft and stack requirements.

The 100 hp boiler with internally finned tubes, for example, is about two-thirds as wide, two-thirds as long, and two-thirds as high as a bare tube boiler of equal capacity and can be installed in limited headroom. Due to the high heat transfer rates of the finned tubes, the boiler comes up to full steam pressure in about ten minutes. The boiler is a self-contained, modular unit and a number of them can be connected together with interlocking controls to provide a variety of capacities.

It is available in standard 30, 60, and 100 hp sizes. Additional illustrations, capacities, and dimensions of the boiler are given in the company's bulletin number 542.

More information? Circle Item 87 on postcard, page 142.

(*Continued on page* 140)

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Class KRVS units ⅓ through 7½ hp.

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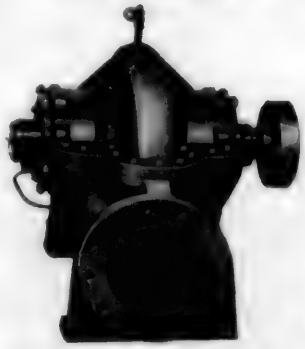
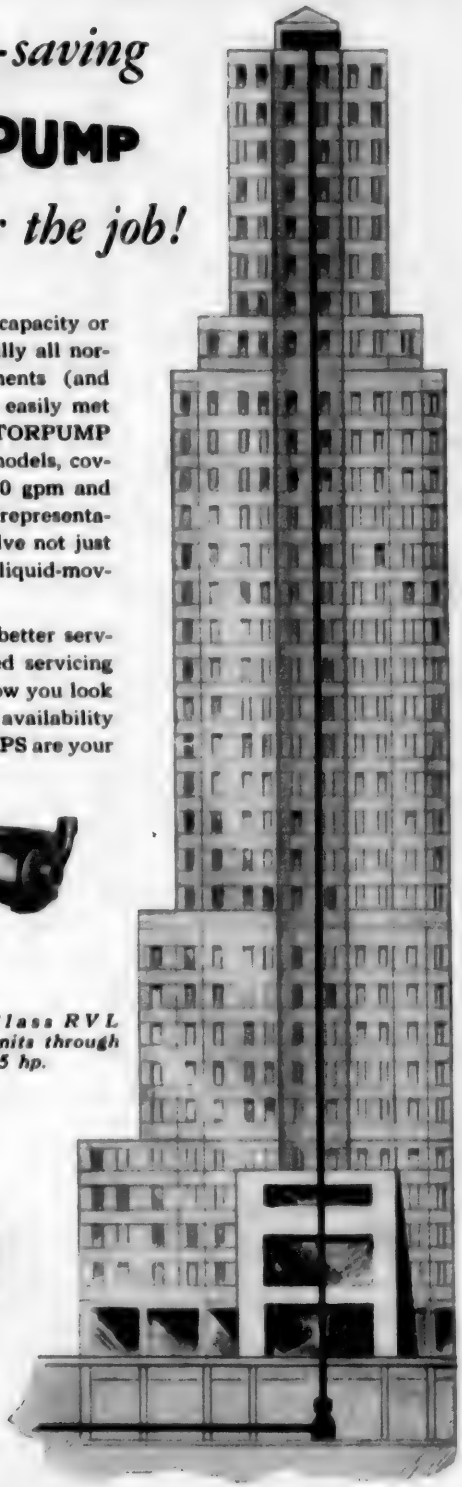


Class DMV units through 150 hp.

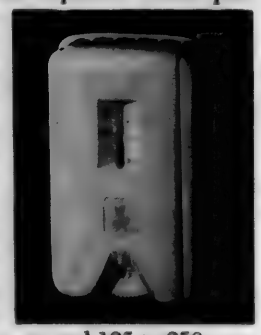


Ingersoll-Rand

9-167 11 Broadway, New York 4, N. Y.

(*Continued from page* 138)

Room Heating Control



A room thermostat, No. 801, that operates within plus or minus one degree of its setting, is announced by Fulton Sylphon Div., Robertshaw-Fulton Controls Co., Knoxville, Tenn.

Intended for cable or blanket type panels, wall heaters, suspended unit heaters, and portable heaters, the thermostat will also provide direct line voltage control of stokers, oil burners, unit heater fan motors, and circulating pumps. Operating on 20 amp and 125 to 250v a-c, it delivers ¾ hp at 115v and 1½ hp at 230v. The size of a standard wall switch, the thermostat has a temperature range of 64 to 80 deg. F.

More information? Circle Item 88 on postcard, page 142.

Room Cooler Prices Dropped

The enlarged 1955 room air conditioner line of Airtemp Div., Chrysler Corp., Dayton, Ohio, includes four deluxe and two custom models. It also includes two casement window models. One of the latter is a new ¾ hp unit which the company is marketing for the first time. Custom models feature reverse cycle operation, providing heating as well as cooling. Reduction of prices from $30 to $100 per unit are announced.

The new prices become effective immediately. The factory retail at factory unit price may also be considered as suggested retail price although freight costs will cause slight price variations in some sections of the country.

More information? Circle Item 89 on postcard, page 142.

Air Space Heater in 48 Models

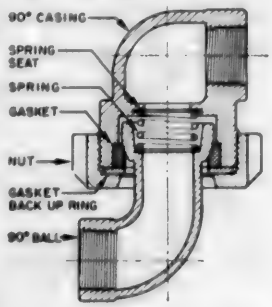
The introduction of a packaged air heater in 48 models with outputs ranging from 400,000 to 2,000,000 Btu per hr is announced by Auto-Therm Mfg. Co., Detroit, Mich. These units, which are suitable for use with oil or gas, are adaptable to space heating of commercial and industrial buildings and may be ceiling suspended or floor mounted.

The air heater is designed for four-pass cross-flow heat transfer resulting in a minimum operating efficiency of 80%. The flame is introduced into the upper portion of the stainless steel combustion chamber which is being wiped by the air to be heated. The products of combustion are then returned to a tube header and passed through conventional economizer tubes to an induced draft fan. A feature of the heater is the design of the four-pass heat transfer without the use of internal stainless steel or refactory baffles. The air to be heated is drawn in at the base of the heater on all four sides and then passed over the heat transfer surface. The heater is equipped with large air fans operating at a relatively low shaft rpm.

More information? Circle Item 90 on postcard, page 142.

High Pressure Swivel Joints

Series 600 Type S swivel joints are now being produced in a complete range of sizes from ½ to 2 inches, in four styles, for high pressures and high temperatures by the maker, Barco Mfg. Co., Barrington, Ill. All stock sizes have malleable iron casing and steel ball; sizes 1½ and 2-inch have steel nut and can also be furnished in all-steel construction on special order. When equipped with all metal gaskets, the 1½ and 2-inch sizes are suitable for working pressures up to 2,000 psi.



Swivel joints of this type are used to provide movement in metal piping connected to moving or movable machinery. These joints feature a unique self-aligning design which simplifies and speeds up pipe fitting. The self-aligning feature also automatically eliminates binding and guards against wear.

More information? Circle Item 91 on postcard, page 142.

1/4 to 3 in. Bronze Gate Valves

A newly-designed line of bronze gate valves for general full-flow service on steam, water, oil or gas is announced by R-P&C Valve Div., American Chain & Cable Co., Reading, Pa. Sizes range from ¼ to 3 inches.

Available in either split or solid wedge, these valves are equipped with a rising stem which gives a visual indication of the position of the wedge. Its operating threads are out of direct contact with the fluid. Stems are made of coradur, an aluminum-silicon-bronze alloy noted for its high corrosion resistance and durability.

Each valve is given hydrostatic shell and seat tests at the factory and is designed for a working pressure of 150 lb. End threads conform to the American Standard for Pipe Threads. Kool-Grip malleable iron handwheels are used throughout.

The split wedge is especially suited for use where body seats might be slightly distorted due to pipe line strains. This taper type split wedge is well guided and accurately machined to assure positive, easy operation. The solid wedge is designed for general use, and is particularly adapted for steam service. There are no loose parts to vibrate or wear as with a two-piece disc.

More information? Circle Item 92 on postcard, page 142.

PRODUCT INFORMATION SERVICE

Use the postage-free postcard below for further information on:

- **News of Equipment and Materials**

or a copy of the following

- **New Catalogs**

Circle the item Numbers in which you are interested and print clearly your name and address with title.

NEW CATALOGS

PACKAGED LIQUID CHILLERS—Packaged Liquid Chillers is the title of Bulletin C-1100-B52 offered by Worthington Corp., Harrison, N. J. Designed for air conditioning and industrial application, the company's line of liquid chillers ranges from 7½ to 150 hp in a varity of models and combinations offering such advantages as low-cost operation; ease of installation; trouble-free operation. Pictorially and graphically illustrated, the bulletin gives specifications, dimensions and applications of various liquid chillers.....Item 128

COOLING TOWER SELECTION TABLES—Three different capacity tables for selecting cooling towers are included in a bulletin, No. 477, published by the Binks Mfg. Co., Chicago, Ill. The bulletin also describes the company's 3-B series cooling towers and lists their general specifications. .....Item 129

MANUAL DESCRIBES BRAKES AND APPLICATIONS—A 16-page brake manual is announced by O'Neil-Irwin Mfg. Co., Lake City, Minn. Entitled Handy Guide to Aid in Selecting and Operating Di-Acro Brakes, this manual contains more than 25 photos and diagrams showing the variety of ways the ten models of Di-Acro standard, box finger and radius brakes can be set up for production or experimental forming jobs. Specifications and capacities on all brakes are listed in table form for easy reference. A complete parts list for all Di-Acro leaf-style brakes is also shown, the company said. .....Item 130

PRESSURE REDUCING VALVES—Folder F126 has been issued by Watts Regulator Co., Lawrence, Mass., and dealing with the company's pressure reducing valves and strainers. It is copiously illustrated and complete with numerous charts and diagrams dealing with pressure reducing valves and strainers to be used in the control of water. Of particular interest to many is the section on general trouble shooting. .....Item 134

BULLETIN ON MI RAPPER FOR PRECIPITATION—A 4-page bulletin describing the MI Rapper, a device for automatic and continuous cleaning of the collection electrodes in a Cottrell electrostatic precipitator is issued by Research-Cottrell, Inc., New York, N. Y. The bulletin includes a schematic diagram of the rapper, an explanation of its basic operating principles, illustrations of its components, and a summary of its features. .....Item 135

PLASTIC PIPE, FITTINGS, VALVES DESCRIBED—Complete technical data on Dur-Ace, a general-purpose corrosion-resistant plastic pipe are given in Bulletin 50-A, announced by American Hard Rubber Co., New York, N. Y. General properties of the pipe, together with chemical resistance tables, standard sizes, pressures, and prices of pipe, fittings, and diaphragm valves are included, together with installation data. .....Item 136

LITERATURE ON DIRECT DRIVE FAN MOTORS—A catalog page on its direct drive fan motors is issued by Electric Motors and Specialties, Inc., Garrett, Ind. The catalog gives construction and engineering data on each of three models, including dimensions, photographs, and detail drawings. Operation and performance characteristics of the units are included. .....Item 137

CASE HISTORY MAILERS AVAILABLE—Case history mailers, available monthly to interested readers, are available from Metron Instrument Co., Denver, Colo. These mailers give readers a quick look at how the company's tachometers and speed reducers work for different industries. Each case history shows a close up photo of the product in use, describes product application briefly, and gives reasons for product selection. In addition, each mailer includes a detachable business card for the readers to insert data about their problems that might be solved by the product shown. .....Item 138

STAINLESS STEEL FAUCET IS DESCRIBED IN BULLETIN—A corrosion-resistant stainless steel, fume-tight sanitary faucet with Kel-F sealing rings is described and illustrated in a bulletin available from Economy Faucet Co., Newark, N. J. It includes data concerning design features, materials of construction, and mechanical and chemical characteristics of interest to process equipment engineers in the chemical, food, pharmaceutical, photographic and allied industries. A section is devoted to outlining the unusual properties of the plastic O ring seals.....Item 139

[illegible] BULLETIN—Publication GL-1, a new 4-page bulletin published by United States Gauge Div., American Machine and Metals, Inc., Sellersville, Pa. summarizes the Gotham line of indicating, recording and controlling instruments in text and photographs. Covered in the bulletin are various types of industrial thermometers, in ranges from minus 40 to plus 950 deg., dial thermometers from minus 300 to plus 1200 deg. F. Recorders for pressure, temperature and humidity are briefly described and illustrated. Pressure recorders included cover ranges from 30 inch vacuum to 50,000 psi. Temperature recorders cover ranges from minus 300 to plus 1200 deg. Humidity recorders use wet-dry bulb system and incorporate the company's new convertible water box, data on which are also supplied. .....Item 140

BULLETIN DESCRIBES LINE OF THERMOSTATS—A bulletin describing its line of Type A thermostats for electronic and avionic devices, appliances, and apparatus is announced by Stevens Mfg. Co., Inc., Mansfield, Ohio. Punched for insertion in standard three-ring binders, the bulletin is printed in two colors. It describes the operating principle and illustrates it with a schematic diagram. The bulletin (L-9070A) also gives performance data, ratings, dimensions, and construction details. Various mounting arrangements are illustrated with photographs.....Item 141

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AIR CONDITIONING, HEATING AND VENTILATING
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READERS' SERVICE DEPT.

INDUSTRIAL INSULATION — Insulation Solutions for All Temperature Problems is the title of a 4-page bulletin issued by Mundet Cork Corp., North Bergen, N. J. Nineteen insulating materials for industrial temperature ranges from —300 to +1900 deg. are described. ..... Item 113

COOLING TOWER CATALOG—Its Flow-Cold cooling towers are described and illustrated in detail in an 8-page catalog [illegible], issued by Acme Industries, Inc., Jackson, Mich. Characteristics of construction are given, and cutaway view shows blower and Z-design cooling pak. Selection procedure, employing accurate, easy-reading curves to specify all principle factors, is given along with a typical selection example. ..... Item 114

HEAVY DUTY FANS—Heavy duty steel and fans, Class II and Class III, with improved power limiting wheels, are described in Bulletin 946 of The New York Blower Co., Chicago, Ill. The 36-page catalog contains dimensional and capacity data as well as descriptive matter on this line of heavy duty fans. ..... Item 115

REVISED AIR CONDITIONING CATALOG—A completely revised two-color, 36-page air conditioning catalog No. 7554 has been released by Young Radiator Co., Racine, Wis. The catalog covers fan performance data, heating and cooling coil performances, filter data, data on mixing boxes, and physical and dimensional data. Other features include typical selection examples which simplify selection and specification of the company's air conditioning units. ..... Item 116

GLOBE AND STOP VALVE CATALOG—Section B of a series of catalog sections issued by Associated Valve & Engineering Co., Chicago, Ill., describes the company's stainless steel globe and stop valves. The 16-page catalog section gives complete data on the valves including [illegible] service range, sizes available, connections, body materials, and special features. Each valve is illustrated with sectional drawings accompanied by a table of roughing-in dimensions. ..... Item 118

SWIMMING POOL DATA BOOK — Its complete catalog and data book of swimming pool supplies, chemicals and equipment is offered by Modern Swimming Pool Co., Inc., White Plains, N. Y. It is a 44-page book, profusely illustrated, containing data, photographs and prices of every item needed to build a new residential or public pool, or to equip and maintain an existing pool. There is a section on proper pool care and maintenance, and detailed descriptions of approved water-treatment chemicals. Herkite, for the control of algae in swimming pools, lakes and reservoirs, is included in this section. This data book is designed to be helpful to plumbing contractors and engineers, as well as to architects, contractors and others interested in sources of supply for swimming pool chemicals and equipment. It gives working drawings, descriptions and prices of a complete range of swimming pool equipment, including filter systems, plumbing fittings and pool ladders. There are photographs, detailed descriptions and illustrations of underwater floodlights, pool vacuum cleaners, observation windows, chlorinators, automatic skimmers, diving boards and stands. ..... Item 117

DISTRIBUTION GRILLES IN COLOR—Air distribution grille frames, with removable electroplated cores, and side-wall diffusers are pictured in a color pamphlet issued by Barber-Colman Co., Rockford, Ill. ..... Item 118

BULLETIN DESCRIBES INDUSTRIAL LIQUID METERS—Full details of several of its recently announced industrial liquid meters are given in Bulletin 507 of Neptune Meter Co., New York, N. Y. Included are Auto-Stop quantity control meters, Auto-Switch meters, Print-O-Meters, and meters with simple direct reading registers. Of interest to process engineers is a chart which helps in the selection of the proper size and type of meter for any given application. Included is a list of nearly 150 common chemicals and liquid ingredients that may be metered with Type S meters. ..... Item 119

STEAM AND AIR TRAP BULLETIN—Its steam and air traps for pressures to 600 psig are described and illustrated in bulletin 5415, issued by The C. E. Squires Co., Cleveland, Ohio. The Mount low pressure steam series for 15 and 25 psig service are also described in the folder. Angle, offset, offset swivel, straightway, inverted bucket and float and thermostatic traps, packless and modulating valves, air vents, and connecting spuds are covered on the last page of the bulletin. ..... Item 120

many photographs illustrating the equipment, there are tables listing the specifications, capacities, dimensions and dimension changes of various types and sizes of fans. Photographs and illustrations are supplemented by brief texts that provide additional information about the equipment and its uses. ..... Item 121

RADIATORS AND HEATING ACCESSORIES—Base board heaters, expansion tanks, burners, and tube boilers are included in a catalog issued by Baseline Mfg. Corp., Minneapolis, Minn., and Washington, D. C. Equipment illustrations, charts, specifications, and installation and operating instructions are given. ..... Item 122

REVISED 5TH EDITION OF TOOL BIT BULLETIN—A completely revised 5th edition of its technical information bulletin on ALX alloy tool bits is available from Allegheny Ludlum Steel Corp., Pittsburgh, Pa. The bulletin includes information on applications, grinding, tool angles, brazing, and stock sizes. ..... Item 123

COAL CHUTE VALVES ILLUSTRATED—An eight page brochure, Form 97, with illustrations and dimension charts of its coal chute valves is issued by Stock Equipment Co., Cleveland, Ohio. Drawings of four different valves are included along with photographs of variously installed valves. ..... Item 124

STEAM GENERATORS FOR SCHOOLS—Steam generators, designed expressly for schools, are illustrated in a brochure issued by Johnston Bros., Inc., Ferrysburg, Mich. A variety of school buildings in which the boilers have been used is also pictured. ..... Item 125

INFRA-RED HEATER ANNOUNCED — Panelblue, a gas-fired heater that generates infra-red rays, and its applications are described in a bulletin, PBI-54, issued by Thermoblue Div., Prat-Daniel Corp., South Norwalk, Conn. ..... Item 126

TUBE DIMENSIONS LISTED—A pamphlet giving the sizes of round and oval welded mechanical tubing is issued by Mikoh Tube Co., Chicago, Ill. ..... Item 127

FLEXIBLE COUPLINGS—A pocket size selection guide, Bulletin 57, containing technical data, ratings, drawings, specifications, service factors, and information on the various uses of its rubber-bronze bushed flexible couplings, is issued by Ajax Flexible Coupling Co., Inc., Westfield, N. Y. ..... Item 128

CATALOG OF AIR VENTING VALVES—A variety of air venting valves for steam and hot water systems is clearly enumerated and illustrated in a 12-page catalog, No. 30-C-54, issued by The Dole Valve Co., Chicago, Ill. The valves are listed according to the system for which they are designed. Specifications, descriptions, and applications are given alongside an illustration of each valve. A water mixer, a water mixer installation, and an automatic warm air register are also described in the catalog. ..... Item 129

ALUMINUM CATALOG AVAILABLE—A detailed and indexed catalog of aluminum sheet, tubing, wire, and other industrial forms is available from Adam Metal Supply, Inc., New York, N. Y. The 68-page catalog consists of dimensions, specifications, and properties of the various forms of aluminum. ..... Item 130

PLEASE SEND US MORE INFORMATION. Check below item numbers on which you wish further information.

101	111	121	131	141	151	161	171	181	191
102	112	122	132	142	152	162	172	182	192
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104	114	124	134	144	154	164	174	184	194
105	115	125	135	145	155	165	175	185	195
106	116	126	136	146	156	166	176	186	196
107	117	127	137	147	157	167	177	187	197
108	118	128	138	148	158	168	178	188	198
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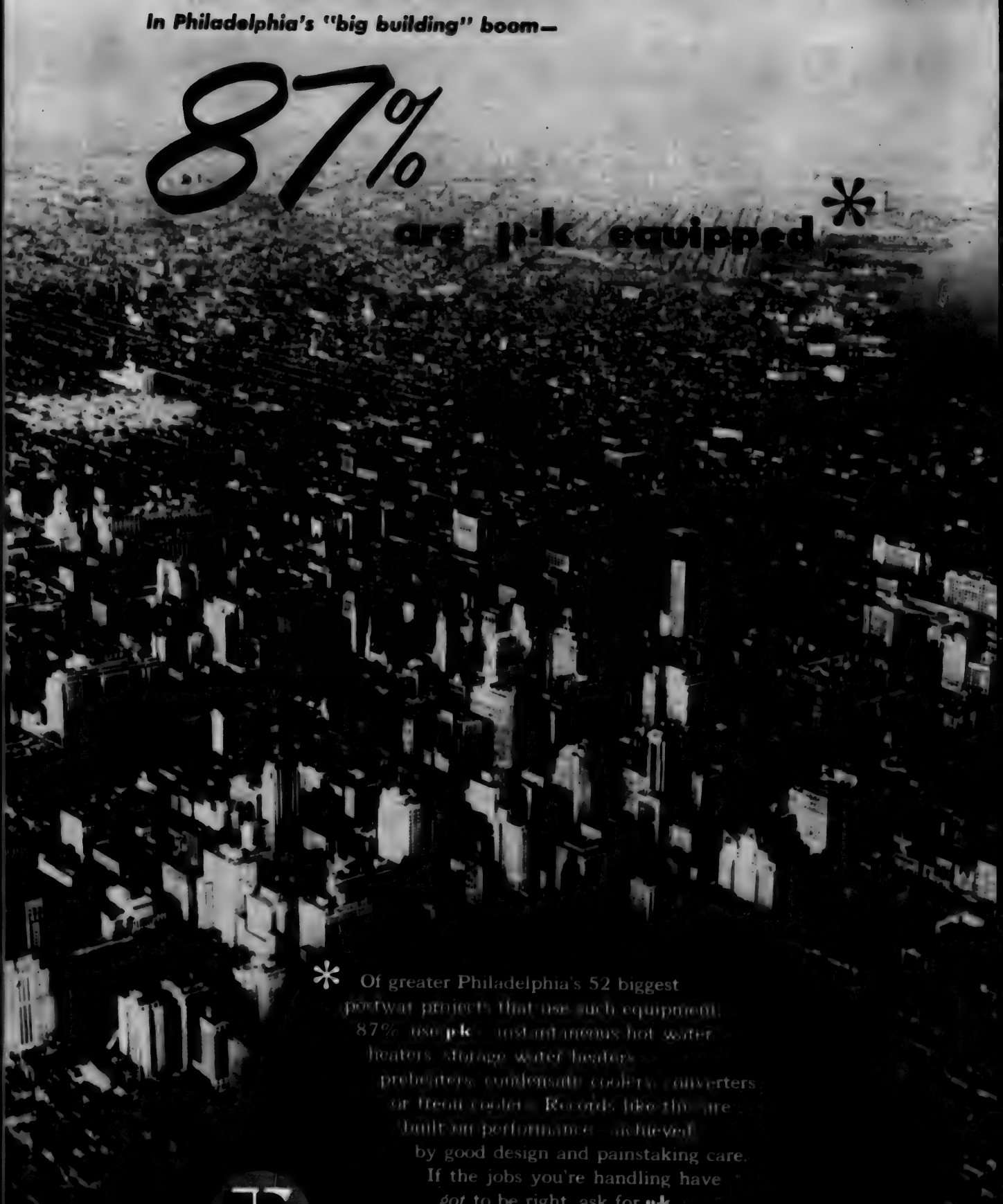
87%

are p-k equipped*



* Of greater Philadelphia's 52 biggest postwar projects that use such equipment, 87% use p-k instantaneous hot water heaters, storage water heaters, preheaters, condensate coolers, converters or freon coolers. Records like this are built on performance achieved by good design and painstaking care. If the jobs you're handling have *got* to be right, ask for p-k.

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PIPING and PLUMBING

Vent Stack Terminal

A VENT stack terminal is that part of the plumbing piping system which extends up through the roof of a building to the atmosphere. This vent pipe, although small by comparison to the overall piping, is nevertheless a vital part of a plumbing system for it is through this open pipe that the air at atmospheric pressure enters the system to hold in balance the water seal contained in each fixture trap. Without this balance of air pressure, the plumbing system, consisting of drainage and vent piping, would not function properly. In addition air movement in the system is necessary to keep the lines fresh and free of odors.

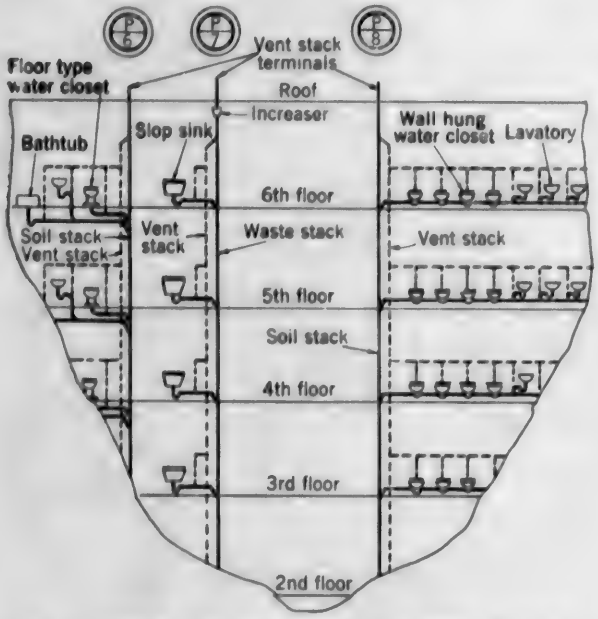


Fig. 1. Partial riser diagram showing vent stack terminals.

Factors that the designer should consider regarding the installation of the vent stack terminal will now be discussed. Fig. 1 shows A portion of a typical riser diagram in which are shown soil and vent stacks, and the manner in which the stacks are projected up through the roof. In the circles above each stack, the number shown is the stack number and *P* is an abbreviation for "Plumbing."

The diameter of a vent stack terminal should never be less than four inches for two very important reasons:

1. A 4-inch diameter line allows an adequate volume of air to enter the plumbing system, and its effective opening is not as easily blocked by foreign matter as would be with a smaller diameter pipe.
2. In climates subject to freezing weather, the warm condensation vapors rising in the line tend to form frost at the pipe opening when contact is made with cold air. This frost coating can block or partially block the effective opening of a pipe smaller than 4 inches in diameter; this condition is remote with a 4-inch diameter pipe. Therefore, when smaller diameter stacks for fixtures other than water closets are involved, the vent stack is usually increased to 4-inch diameter below the roof level. This larger diameter pipe is then extended up through the roof to serve as the roof stack terminal. A typical detail of this connection is shown in Fig. 2.

Projection Above Roof

The height to which a vent stack terminal should be

(*Continued on page* 146)

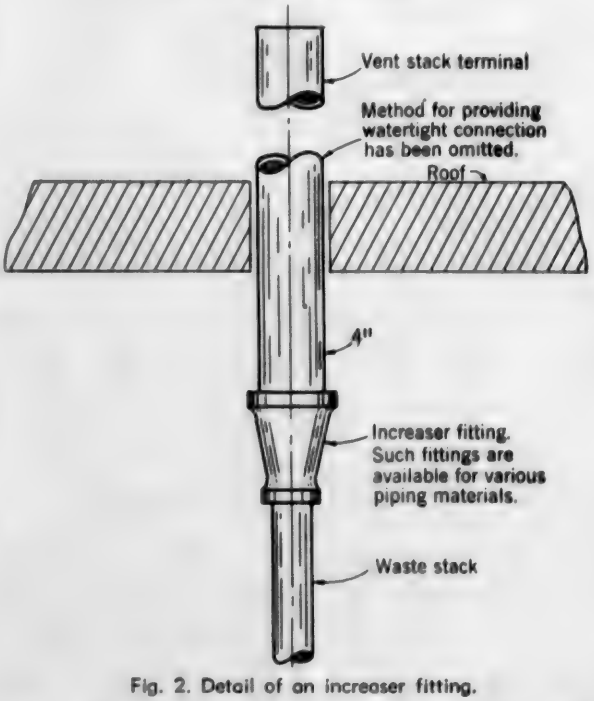

Vent stack terminal
Method for providing watertight connection has been omitted.
Roof
4"
Increaser fitting. Such fittings are available for various piping materials.
Waste stack

Fig. 2. Detail of an increaser fitting.

TVC Condensate Pumps

LOW PRESSURE SYSTEM

LOW RETURN CONNECTION
LOW SPEED, LONG LIFE
CAST IRON RECEIVER
SINGLE OR DUPLEX

A SINGLE UNIT easily converted at any time to a DUPLEX UNIT

Specify the "Convertible" TVC in the 15 gallon receiver when ordering low pressure system condensate pumps.

Capacities from 500 to 10,000 sq. ft. E.D.R.

Available from Jobbers' Stock

The Single Unit TVC Condensate Pump in a 15 gallon receiver can be converted to a DUPLEX UNIT whenever load or other conditions require. Each receiver is furnished machined and drilled for the addition of another pump and control.

Conversion to a Duplex Unit doubles the capacity of the unit, or where desired, provides a stand-by pump. Additional pump is installed right on the job. Removal of the unit is unnecessary.

• Dimensions

15 gallon cast iron receiver for single or duplex units: diameter 25½", height of return above floor—7⅜".
10 gallon cast iron receiver (for single units only): diameter 21", height of return above floor—6⅞".

• Features

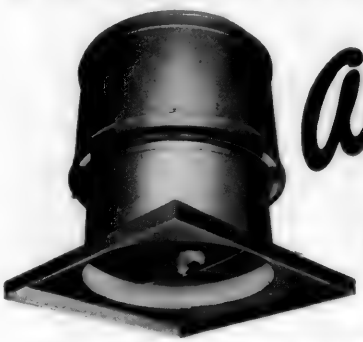
TVC Condensate Pumps are low speed (1750 RPM) for long life, are readily installed in area where space is important. Their compact cast iron receiver and sturdy pumping unit assure a trouble free installation.

• Installation

Simple installation consists of connecting return line to receiver, and connecting discharge to boiler, using a check valve and a gate valve. Unit is completely assembled at the factory. Send for Bulletin TVC300.

weil PUMP CO. 1516 N. FREMONT ST. • CHICAGO 22

For removing a LARGE VOLUME of Fumes or Air at HIGH VELOCITY



allen

VERTICAL DISCHARGE FAN

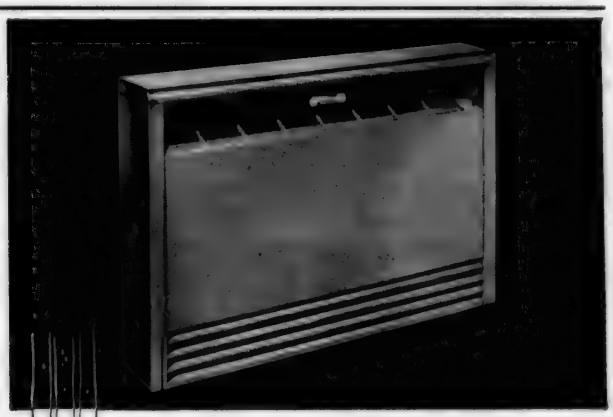
Whenever you face the problem of discharging fumes or vapors through a roof ventilator so that they will not short circuit back through building openings, you'll find the solution in this new Vertical Discharge Fan. It is designed especially for industrial applications that require the removal of a large volume at high velocity. The "VD" roof fan is fabricated of zinc-coated iron sheet with welded construction throughout. Automatic wing dampers open with air blast, close weathertight when not operating. The "VD" is available as direct drive with motor mounted inside air stream or as "VDR" with motor mounted outside throat of ventilator. Either type is available in a wide range of capacities and sizes.

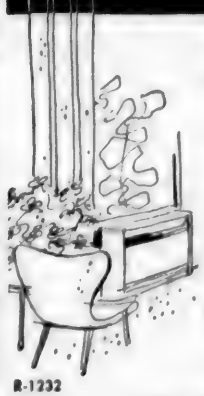
Write for catalog on complete line of roof ventilators.

ALLEN ENGINEERED VENTILATION

ALLEN COOLER & VENTILATOR INC.
ROCHESTER, MICH.

Roof Ventilators for Every Commercial and Industrial Need





R-1232

Superb styling... Superb performance

WHEN top architects and heating engineers want the finest in modern heating, they specify Modine Convector Radiation. Here's an unmatched combination of beauty, long life and uniform, healthful heating. Ask your Modine representative for full information — he's listed in the classified section of your phone book. Or write for Bulletin SA-54, Modine Mfg. Co., 1511 DeKoven Ave., Racine, Wis.

Modine

convector radiation

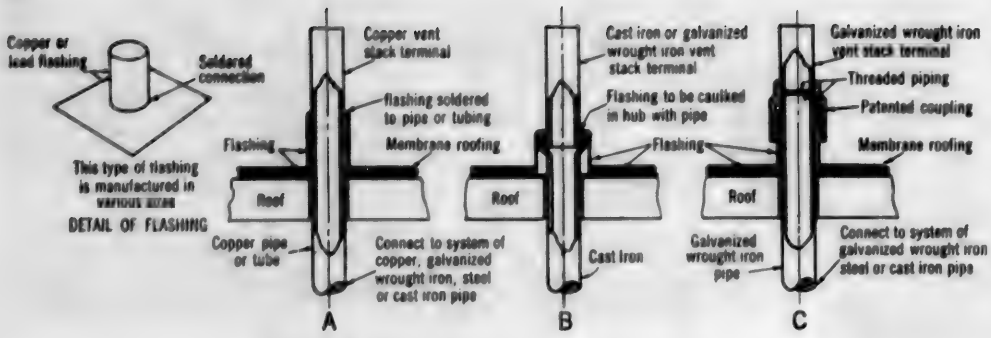


Fig. 3. Typical vent stack terminals with a detail of flashing.

(*Continued from page* 144)

projected above the roof is normally determined by local code requirements. This height generally varies from one foot to several feet. The code also has requirements pertaining to the location of the effective vent opening with regard to windows, doors or roof construction.

Roof Penetration

Since the vent stack will penetrate the roof, adequate steps must be taken to provide a watertight installation. There are a number of methods that may be used, and Fig. 3 indicates three of the more common methods used to furnish the necessary watertight connections.

Detail *A* of Fig. 3 indicates a copper vent stack terminal. The copper or lead flashing is soldered to the pipe as shown, thereby assuring a watertight connection. This method may be used when copper piping or tubing is the material specified for the entire drainage and venting system. Often, copper pipe or tubing is installed only for the vent stack terminals, with the rest of the system of other material.

Detail *B* shows a vent stack terminal consisting of cast iron pipe with the terminal itself of galvanized wrought iron pipe. The copper or sheet lead flashing is turned into the hub of the cast iron pipe as illustrated, and caulked in place with the wrought iron pipe. This method of installation also provides for a durable and watertight connection.

Detail *C* pictures a design using a galvanized wrought iron vent stack terminal and the application of a patented roof coupling, of which there are numerous types. The copper or lead flashing is slipped over the vent stack protruding through the roof. Next the roof coupling is slipped over the top of the flashing and is screwed to the piping. The upper portion of the piping is then screwed in place and the installation is complete with a watertight connection assured.

Of the three methods shown, preference is given to the method using the patented roof coupling because it is easy to install, offers a neat appearance, and provides a watertight connection having durable qualities.

Effects of Wind

Winds of sufficient force can affect the function of the drainage and venting system. In certain areas where: (1) strong winds are prevalent, (2) when the vent stack terminal is located on the top of a tall building or (3) at a high elevation where it will be exposed to severe wind conditions, provisions should be considered to shield the vent from such winds.

A strong wind blowing across the effective opening of the vent stack terminal can create unbalanced air pressures within the piping system, thereby causing the fluctuation or loss of water seal in the fixture traps. This can result in the discharge of odors into rooms in which there are plumbing fixtures.

To protect the effective opening in the pipe from the direct blast of the wind, a device called a cowl is employed. The cowl is installed to deflect the wind away from the vent opening thereby eliminating the possibility of air pressure fluctuation in the piping system. There are many types of cowls available for this purpose, some stationary and some that revolve. Figure 4 illustrates two types of cowl frequently used for this purpose.

The stationary cowl of Fig. 4 is similar in shape to a dome. This dome will deflect the wind from the pipe opening and yet allow the required volume of air to enter the piping system. The dome will not hamper the flow of warm air generated in the piping system to the atmosphere. This cowl may be fastened to the pipe with bolts or set screws as provided by the manufacturer.

The revolving cowl of Fig. 4 is a patented type of cowl. It is designed to turn or rotate with the direction of the wind. By this means, the effective vent opening in the cowl will always be turned away from the force of the wind so that venting will not be affected by wind conditions. This type of cowl may also be fastened to the pipe in a manner devised by the manufacturer. Now for a note of caution concerning the use of the revolving type cowl. Unless the cowl is periodically inspected and maintained, the unit will stick and defeat its purpose.

Foreign Objects

Often vent stack terminals are installed in locations

(*Concluded on page* 148)

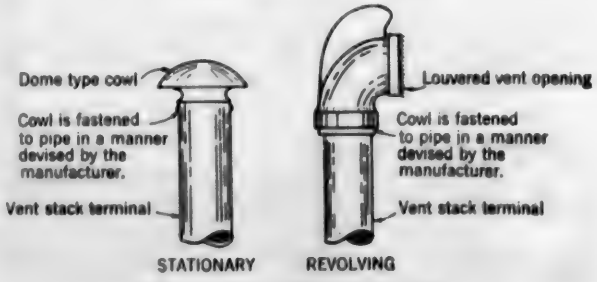
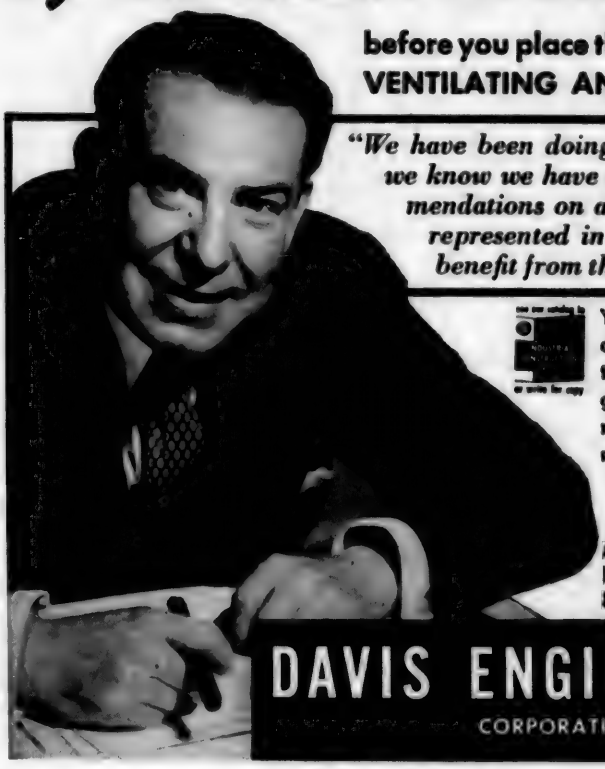

Dome type cowl
Cowl is fastened to pipe in a manner devised by the manufacturer.
Vent stack terminal
STATIONARY
Louvered vent opening
Cowl is fastened to pipe in a manner devised by the manufacturer.
Vent stack terminal
REVOLVING

Fig. 4. Detail of typical cowls.

By all means...check with Paracoil

before you place that order for INDUSTRIAL HEATING, COOLING, VENTILATING AND PROCESS HEAT EXCHANGER EQUIPMENT



"We have been doing just that for over a quarter of a century—and we know we have saved ourselves thousands by taking their recommendations on any problem involving heat exchangers. They are represented in all principal trading areas, too, so you also can benefit from their experience, just as we have through the years."

You are so correct, Mr. PARACOIL CUSTOMER. Whenever well designed and well built heat exchangers — adequately engineered to give customer satisfaction year after year — are being investigated, the smart buyer has always preferred PARACOIL equipment! They always have had that *extra something* that made them more than just an assembly of tubes inside of a shell!

Paracoil Heat Exchangers for the heating, piping and air conditioning contractor include:

AIR HEATERS & COOLERS • CONDENSATE COOLERS • CONVERTORS • FUEL OIL HEATERS INSTANTANEOUS WATER HEATERS • LAUNDRY HEAT RECLAIMERS • LUBE OIL HEATERS & COOLERS • TANK STORAGE TYPE WATER HEATERS • WASTE HEAT EXCHANGERS

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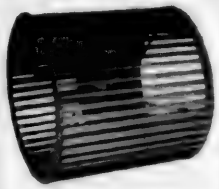
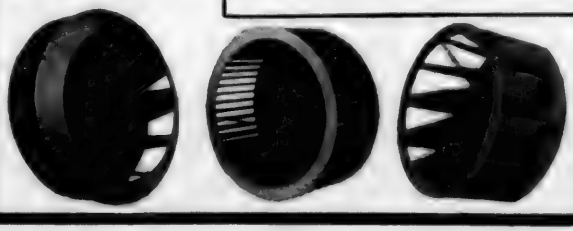
30 Rockefeller Plaza, New York 20, N. Y.
Write for catalog information

BARRY *Industrial* BLOWER WHEELS



Built to your specifications. All types heavy duty wheels — single inlet, double inlet, forwardly curved, and backwardly curved — all sizes 6" to 72" diameter. Welded or riveted construction. Prompt deliveries. BARRY blower wheels are precision built, expertly trued, and perfectly balanced by specialists for long, smooth service. Send specifications for quotation, performance data, etc. to BARRY BLOWER CO., 3110 California St. N. E., Minneapolis 18, Minnesota.



NEED heavy duty, large capacity water level controls? Maid-O'-Mist's No. 6900 series float control diaphragm valves are especially designed for air conditioning equipment, evaporative coolers, air washers, etc., and will accurately control water at any level. Water can be discharged upward or downward as specified.

WATER LINE FLOAT CONTROL VALVES

- √ CAPACITIES: 1¼ gals. to 6 gals. per minute
- √ CAST BRASS BODY
- √ COPPER FLOAT
- √ NEOPRENE DIAPHRAGM
- √ INLET AND OUTLET TAPPING ½" I.P.T.

BRASS MOUNTING PLATE
Available for special mountings

See your jobber or write

MAID-O'-MIST, Inc.
3317 NORTH PULASKI ROAD CHICAGO 41 ILLINOIS

(*Concluded from page* 146)

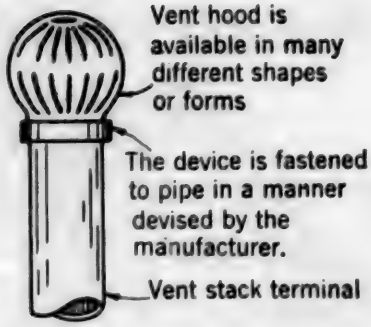
where they are within the reach of children as in the case of apartment house roofs. If the vent opening is not protected, rubber balls, sticks or other objects may be dropped into the pipe. These objects can cause severe stoppages and many times present a difficult removal problem. Objects such as sticks can lodge in the piping and although they might not cause complete stoppage, they can block the line sufficiently to interfere with the proper venting of the system.

To prevent these occurrences, a vent hood is employed. This device is placed over the vent opening and is securely fastened to the pipe. Although there are numerous types manufactured for this purpose, one typical device is shown in Fig. 5.

From Fig. 5 it is apparent that the hood will prevent large objects from being dropped into the vent stack terminal. When cowls are used, this device is not necessary since the cowls are equipped with louvers or screens. In the case of the dome type cowl, there is not enough space between cowl and pipe opening to insert large objects.

The same provisions may be applied to sloping roofs.

Fig. 5. Vent hood placed on top of a stack terminal.


Vent hood is available in many different shapes or forms
The device is fastened to pipe in a manner devised by the manufacturer.
Vent stack terminal

For this condition there are, similarly, numerous devices available for furnishing watertight connections with the various types of roofing encountered. Cowls similar to those shown may be used to shield the vent opening from strong winds.

When careful consideration is given to the proposed installation of the roof stack terminal, a properly vented plumbing system will be assured and a number of problems will be avoided.

Engineers Turn Time Back to Aid Hospital

In a remote area deep in southern Utah, medical science is taking a step forward—aided by a group of Minneapolis engineers who turned back 40 years in their own progress to lend a helping hand.

The heart-warming story concerns Saint Christopher's Mission to the Navajo, near Bluff, Utah, and the efforts of its resourceful head—Brother Juniper, O.B.S.F.—to overcome lack of funds and other overwhelming odds to erect a modest hospital for the people he serves.

Here, in a land of the Navajo far from any city, 35 miles from an electric power line, a man may lie injured and bleeding while medical aid comes from 50 miles away over a dirt road and wagon trail. Hospital beds and medicine are, of course, scarce.

Honeywell engineer rebuilds damper flapper for Indians.

The nearest Indian service hospital to the volunteer Episcopal mission Brother Juniper heads is 150 miles away. That is why he's struggling to build his own hospital. He's still got plenty of problems but, with the aid of the Minneapolis engineers, he has just cleared one major hurdle—that of providing comfortable, automatic heat despite the fact that the hospital has no continuous source of electricity.

Because Brother Juniper is using an old-style hand-fired steam boiler as a source of heat and because of the lack of continuous electricity, he was told there was no way to control the boiler without running up and down the basement stairs to do it by hand. But Brother Juniper isn't easily discouraged. He remembered that when he was a boy, his father had a similar boiler in their home and that it was controlled by a hand-wound clock-like mechanism with a chain that opened and closed the damper automatically.

He set forth his problem and also his boyhood recollections in a letter to Minneapolis-Honeywell Regulator Company. Did the company still make the clock-like device? And, if so, how much would it cost?

From his description, Honeywell engineers recognized the device as the company's old "damper flapper" which was one of the first automatic furnace controls built in America. Although it hadn't been produced for years, the engineers knew some of the old damper flappers were still in existence.

They started a search and found one—about 40 years old—that had recently been removed from a building. Engineers took it apart, repaired and rebuilt the ancient spring-wound motor.

They added a modern thermostat, safety control, compiled step-by-step instructions on how to install the unit and dispatched it to Brother Juniper with their good wishes.

"If this 20th century version of the 'damper flapper' works as well as the one we had at home," the missionary head said in a letter of thanks, "I am sure it will be fine."

Airsan Viro Crimp
HIGH VELOCITY AIR FILTERS

VIRO CRIMP MEDIA
has special Hemmed Edges for strength and safe, easy handling. No cuts! No Scratches! No Filter surface damage.

AFI MEMBER AIR FILTER INSTITUTE

- MAXIMUM EFFICIENCY (288 — 510 FPM)
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- NO DIRECT AIR PASSAGE
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Also Available . . .
Low Velocity and Grease Filters.
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A few distributorships available.
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Now—3/4" and 7/8" sizes*

LIQUID EYE ® INDICATORS
2,000 SERIES

COMPLETELY ASSEMBLED, TESTED
—ready for line installation!

LIQUID EYE *Features:*

- Pyrex glass, double sealed at sides and ends.
- Spring loaded gaskets for positive sealing.
- One-piece copper construction.
- Guaranteed to 500 psi.
- Full line flow—no restriction.
- Instant analysis of refrigeration condition.

** larger sizes available soon.*

Sold by leading Wholesalers. Send for Catalog D-55 covering the complete Allin Line

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Allin MANUFACTURING COMPANY
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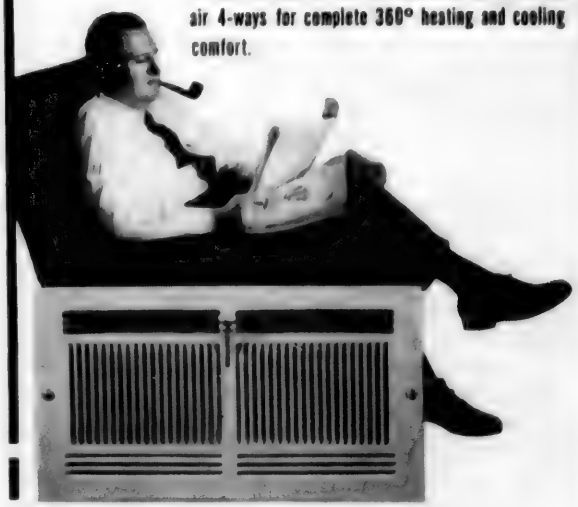
only the comfort comes through!

Standard Stamping's No. 551 Registers eliminate blasts, hot spots, and cold corners by diffusing air 4-ways for complete 360° heating and cooling comfort.



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STANDARD STAMPING & PERFORATING CO.
3131 W. 49th Place Chicago 32, Ill.

NEWS OF THE MONTH

HARD COAL

takes setback as world's largest breaker and several mines close down.

The sorely pressed anthracite miners received another jolt on January 4 when two mines, the world's largest hard coal breaker and two stripping operations were closed down throwing some 1,700 men out of work in Pottsville, Pa. Philadelphia & Reading Coal & Iron Co. announced it was closing the Locust Gap and Potts mines, the Locust Summit Central Breaker and two stripping operations adjoining the mines. The installations affected are in Schuylkill and and Northumberland Counties.

• **MARKET.**—George J. Clark, vice-president and general manager, said the action was made necessary by market conditions. The closing is a part of an over-all economy program designed to reduce company operating losses, Mr. Clark said in a statement. Philadelphia & Reading employs about 6,000 men in the area. The reduction amounts to about 25 percent of the working force. Mr. Clark said the adverse conditions of the anthracite industry continues unabated and attended by overproduction and insufficient price realization. He indicated that no further reductions are contemplated at the present time, adding that the future market would be the guidepost for employment.

• **UNEMPLOYED.**—The Pennsylvania hard coal area has been hit periodically in the last year by mine closings. In the spring, Lehigh Coal & Navigation Co. shut down its Panther Creek Valley operations, leaving some 5,000 miners and office personnel out of work. Some of these operations have since reopened under leasing agreements, and more than half of the former working force is back on the job. Long-time residents of Pottsville said they didn't know what the unemployed miners would do. It was indicated some might turn to bootleg coal operations, others go on compensation.

AIR POLLUTION ABATEMENT

to get attention in several state and county proposals for new laws in 1955.

New laws aimed at curbing air pollution will be sought in the legislatures of several states during 1955, according to reports from various state capitals.

• **CALIFORNIA.**—Governor Knight indicated he would ask the California legislature to appropriate several million dollars for smog cause-and-cure studies by the University of California. Other legislative proposals dealing with the state's air pollution problems also will be considered by the California solons.

• **OKLAHOMA.**—An Oklahoma state legislative interim committee has been studying proposed air pollution control legislation of broad interest among smelters, coal mining companies and cotton ginners. Patterned after an Oregon law, the proposed Oklahoma legislation would set up a pollution control commission within the State Department of Health.

• **DELAWARE.**—Delaware's State Board of Health recently expressed belief that a study of the air pollution control problem is needed for effective legislation. Such a study, it was suggested, would attempt to learn the need in the state for authority to cut down on excessive dust in the air or obnoxious factory fumes.

• **WASHINGTON.**—Members of the Seattle City Council, in reviewing topics of potential new laws to suggest to the 1955 Washington state legislature, agreed that any proposed law dealing with air pollution should be sponsored by the Association of Washington Cities rather than by Seattle. Some Seattle Councilmen expressed doubt, however, as to the desirability of a law which would create a statewide authority to regulate air pollution. They favored voluntary conferences of officials of Puget Sound cities for effective Puget Sound regional action.

Another Seattle councilman, Charles M. Carroll, warned that regulations which would require extensive new equipment to control air pollution might prove so costly that some businesses would have to close their doors.

P. N. Royal, an official of the Seattle city engineering department, said the Washington State Legislative Council, an interim study agency, had prepared a bill for introduction in the 1955 legislature which would set up a statewide air pollution control commission.

• **NEW JERSEY.**—State legislative action on the air pollution control problem during 1954 was featured by enactment in New Jersey of a new law providing for the establishment within the State Health Department of a new seven-member State Air Pollution Control Commission.

The New Jersey law directed the commission to study the extent of air pollution in the state and to formulate regulations to reduce such contamination. The commission was further empowered to enforce such regulations and to recommend further legislation.

Meanwhile, continuing legislative and administrative efforts to cope with the air pollution problem are being made at the county and municipal level throughout the country.

• **ARIZONA.**—In Arizona, for example, the Maricopa County Planning and Zoning Commission recently passed an ordinance aimed at keeping out industries which might create smog conditions. Commission Chairman H. S. Abbott indicated the new ordinance was aimed mainly at keeping out of the Phoenix area a proposed oil refinery.

• **LOS ANGELES.**—Among recent steps to deal with the Los Angeles smog problem, the Los Angeles County Board of Supervisors ordered Gordon P. Larson, director of the County Air Pollution Control District, to draft regulations covering the following six objectives:

(1) Curtailing, reduction or relocation of air-polluting industries.

(2) Elimination of excessive fumes from automobile exhausts.

(3) Compulsory use by trucks and buses of liquefied

(*Continued on page* 156)

Ad-Digest SERVICE

Below and on the following pages are given brief digests of the advertisements appearing in this month's issue. Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail the prepaid postcard to request further information from manufacturers.

NOTE: While every attempt is made to list all advertisements, those which are received after the published closing date may not appear. The Index of Advertisers lists all the advertisements in this issue.

GALVANIZED STEEL FOR DUCTS. Page 29. Galvanized steel for gutters, downspouts, air conditioning and furnace ducts, and other applications requiring a durable zinc-coated material. This galvanized steel is made with a tight zinc coating that resists cracking, peeling and flaking and offers better resistance to corrosion. .....Item 201

CENTRIFUGAL PUMP. Page 168. Designed for air conditioning systems, this pump is equipped with a reversible ceramic floating seat and carbon washer combination held by a stainless steel spring in addition to a rotary type mechanical shaft seal. The shaft is solid stainless steel, preventing rust or corrosion even when cooling water is chemically polluted. Bulletin is available.....Item 202

STEAM GENERATORS. Page 47. Fully automatic steam generators for gas or oil are made in 13 sizes from 20 to 600 boiler horsepower and for pressures to 250 psi or for hot water. Chart shows results of tests conducted at Lehigh University on a boiler which had been in actual service for over a year. Catalog available. .....Item 203

SMALL MOTORS AND BLOWERS. Page 185. A customer engineering service maintained to help you find exactly the motor you need for the job you want done. This company specializes in the design, development and manufacture of micro-motors up to 1/8 hp, small blowers up to 230 cfm, and controllers.....Item 204

CONVECTOR RADIATION. Page 146. Convectors provide a combination of beauty, long-life and uniform, heating units have superb styling and provide excellent performance. A special bulletin is available. .....Item 205

REMOTE ROOM AIR CONDITIONERS. Page 70. These units are easy to install because of individual operation. They can be turned off when the suite is vacated. They operate quietly, with a minimum of noise and vibration and the temperature can be selected by the guest. .....Item 206

AIR CONDITIONER PUMPS. Page 23. A complete line of centrifugals for air conditioning application, ranging in size from 1/3 to 2 hp motor-mounted or belt-driven models. The units have capacitor-type motors with built-in overload protection available in single or dual voltage for single or 3-phase current. Bulletin available. .....Item 207

SELF-CHARGING ELECTROSTATIC FILTER. Page 11. A washable, self-charging electrostatic air filter has a permanent, natural static electric charge that gives you an efficient cleaning action that does not wash off or wear away. The filter looks and installs like regular replacement filters and slips into standard filter holders in most heating or air conditioning systems. .....Item 208

DRAFT CONTROLS. Page 167. You can eliminate heavy fuel wastes with complete safety by installing these draft controls made for commercial and industrial gas heating. Leading gas companies recommend them. Technical information and performance data is available.....Item 209

CORROSION RESISTING DRAIN LINES. Page 66. Acid-proof drain pipe and fittings are used wherever there is a severe corrosion problem in laboratories, schools, hospitals and industrial buildings. This company's drain lines were installed in a new antibiotic laboratory for the corrosive waste disposal lines. Catalog available. .....Item 210

PACKAGED AIR CONDITIONERS. Page 28. Space and money are saved by putting packaged air conditioners in an unused elevator shaft of a 12-story southwest landmark. Five sizes, from 7 to 13 tons, can be used singly or in multiples to meet air conditioning needs of any building. Architectural data available. .....Item 211

PACKLESS DIAPHRAGM VALVES. Page 50. When you have valve problems with hard-to-hold fluids, try this company's valves. They eliminate stem leakage and maintenance on air, vacuum, gas, light oil and similar services. Their diaphragm has longer life, yet should it fail, their separate discs prevent escape of line fluid. Folder available. .....Item 212

SMALL CENTRAL-STATION TYPE BOILER. Page 45. Ideal for small to medium-sized installations, this boiler is available in individual units in capacities to 36,000 lb of steam per hr and can also be applied to high-temperature water-heating service. Fully automatic operation provides easier, more efficient response and control of combustion over the load range. Bulletin available. .....Item 213

HIGH VELOCITY AIR DISTRIBUTION SYSTEM. Page 27. All-air high velocity units offer scientific air diffusion and are provided with an aspirating or high induction type air diffuser which is designed to diffuse air without drafts. Each unit can be pressure balanced by an easy-to-operate balancing device and a calibrated orifice. Selection manual available. .....Item 214

CONTROLS, MOTORS, AND DRIVES. Pages 36-37. A large stock of control-motor-drive equipment commonly used in air conditioning installations is maintained and an efficient warehouse inventory system locates seldom-called-for items within hours after you call. Nationwide service shops assure your customers factory-approved parts, equipment, and fast, efficient service. Engineering literature available. .....Item 215

AIR FILTERS. Page 57. The selection of air filters is one step where it doesn't pay to save on the cost of building. For a few dollars more you can buy the right type of air filter to fit the job and be sure of cleaner air, longer service life, and lower maintenance costs for many years. Catalog available. .....Item 216

LOW PRESSURE SYSTEM CONDENSATE PUMPS. Page 145. A single unit condensate pump in a 15 gal receiver that can be converted to a duplex unit whenever load or other conditions require. Each receiver is furnished machined and drilled for the addition of another pump and control. Bulletin available. .....Item 217

WELDED FIREBOX BOILER. Page 71. Leakproof dependable performance from an all-welded firebox boiler. The precision-formed, fusion welded boiler remains tight under all operating conditions. Twelve sizes are made to cover service requirements from 25 hp to 304 hp. Bulletin available. .....Item 218

Circle numbers corresponding to the advertisements in which you are interested, print your name and address clearly. Information will be sent directly from manufacturers.

PLEASE SEND US MORE INFORMATION

Circle below Item numbers on which you wish further information.

201	202	203	204	205	206	207	208	209	210	211	212	213	214
215	216	217	218	219	220	221	222	223	224	225	226	227	228
229	230	231	232	233	234	235	236	237	238	239	240	241	242
243	244	245	246	247	248	249	250	251	252	253	254	255	256
257	258	259	260	261	262	263	264	265	266	267	268	269	270
271	272	273	274	275	276	277	278	279	280	281	282	283	284
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Ad-Digest SERVICE

INSULATING PIPING SYSTEMS. Page 22. No need to gamble on efficient, long lasting insulated piping systems. Prefabricated insulated piping systems for both overhead and underground use. Catalog available. .....Item 211

125 TONS A MINUTE. Page 72. Venezuelan tunnel, 6035-ft long, vented by nine 72-inch and ten 84-inch fans mounted above the portals and in two adits at quarter points. The former fans are powered by direct-connected, 2-speed motors, the latter by wound-rotor, and squirrel-cage motors mounted in tandem. Bulletin available. .....Item 220

SELF-CLEANING AIR FILTER. Pages 16-17. Once-a-year air filter maintenance is a reality with the renewable media filtering curtain supplied in roll form. The automatic self-cleaning air filter consists of two 4-ft wide by 8-ft high sections having a total capacity of 25,760 cfm. Made of bonded glass fibers it is sufficiently resilient and flexible to permit packaging 75-ft lengths in compact 13-inch diameter rolls. Catalogs are available. .....Item 221

HOW TO CUT DUCT COSTS. Page 146. Wall exhausters are a solution to the problem of reducing long and elaborate duct runs connected to power exhausters. One simple opening through the outer wall permits a wall exhauster to be connected directly to the area of ventilation. Item 222

CONDENSATION TOWER OR CONDENSER. Page 78. You select an inner-fin evaporative condenser coil or a copper deck cooling tower with either propeller fan or blower fan. The unit's flexibility enables the dealer to maintain a complete stock, without being burdened with excessive inventory. Both tower deck and condenser coil are made of copper. .....Item 223

FREE COLORFUL CATALOG. Page 148. Photos and valuable information on oil-fired unit heaters are given in free catalog. How they work; how and where to install; how to estimate; and how to order are all contained in the catalog. ..Item 224

AIR COOLED FAN BEARINGS. Inside back cover. For temperatures up to 750 deg F, here is a simple, dependable inexpensive feature on this company's standard fans. Costlier water cooled bearings are not required. A cooling wheel circulates air, takes heat from fan shaft and intercepts radiant heat. Bulletin available. .....Item 225

INDUSTRIAL BLOWER WHEELS. Page 147. Built to your specifications of welded or riveted construction. Single inlet, double inlet, forwardly curved, and backwardly curved heavy duty blower wheels, are made in all sizes from 6 to 72-inch in diameter. .....Item 226

MOTOR CONTROLS. Page 36. Air Conditioning and refrigeration motor controls whose silver alloy contacts need no maintenance. Reliable overload protection is provided by two accurate thermal relays. Bulletins are available. .....Item 227

MAGNETIC COUPLING PRESSURE GAGE. Page 157. A precision instrument sensitive to pressure, pressure differentials or vacuum from 0-1 inch water or 0-3 psi. A magnetic force transmits pressure fluctuations thereby eliminating friction between the flexible diaphragm and the indicating mechanism. Bulletin available. .....Item 228

GLASS FIBER DUCT INSULATION. Page 13. Flexible duct insulation of fine glass fibers available with factory-applied vapor barrier. The insulation springs back to full original thickness after being compressed. Recently examined insulation installed 7 years ago shows no indication of air erosion. .....Item 229

INDUSTRIAL OIL BURNERS. Page 64. Automatic industrial oil burners that preheat the oil are described as extracting more heat per gallon of fuel and as being adaptable to any boiler room. A horizontal rotary oil burner, it is a complete forced draft combustion system with all parts factory assembled and tested. Models for every industrial need are made with capacities up to 600 boiler horsepower. Free catalog is available. .....Item 230

COPPER WATER TUBE. Page 38. Copper water tube for radiant heating installation is made in long lengths of 60 and 100 feet. The tube is light in weight, can be easily bent by hand, and quickly joined with leakproof solder joint fittings. Once installed, the copper tube cannot clog with rust. .....Item 231

EXHAUST FUMES FROM BOILING BRASS. Page 1. A motor driven axial-flow fan in a patented, divided housing eliminates the need for hoods above brass boiling furnaces. The high velocity of the fans makes it possible to use open ducts behind the furnaces. Produced in sizes from 1140 to 15,000 cfm. The motor is mounted in an isolated chamber around which flue gases pass. Illustrated catalog available. .....Item 232

HOME WATER COOLING AND HEATING SYSTEM. Page 35. A single unit makes a combination hot water heating system and a chilled water cooling system. Using a one-pipe or two-pipe system, it provides forced hot water heat or chilled water cooling using the same system. And because each unit is individually controlled, you can heat or cool as few or as many rooms as desired. Detailed information is available. .....Item 233

DRY AIR WITH EXACT MOISTURE CONTROL. Page 157. An air conditioning unit has its cooling and heating functions made separate from adding or taking away moisture. No moisture sensitive instruments are needed. There are no solids, salts or solutions to be handled. At normal atmospheric temperatures it needs no summer re-heat. Two bulletins are available. .....Item 234

STEAM OR HOT WATER BOILERS. Page 49. Forced-draft, four-pass construction boilers made for heating or processing in sizes from 15 to 500 hp and 15 to 250 psi. Five square feet of heating surface per boiler hp produce 80% operating efficiency when fired with oil. Burner design makes it possible to interchange gas and oil firing in 10 sec. Catalog available. .....Item 235

INTERIOR FIRE-PROTECTION. Page 139. Standpipes judged on trade-preference, number of installations, sales volume, selection of items, pricing, and delivery. .....Item 236

LIQUID EYE INDICATORS. Page 149. Liquid eye features Pyrex glass, double sealed at sides and ends; spring loaded gaskets for positive sealing, and one-piece copper construction guaranteed to 500 psi. Catalog available. .....Item 237

VERTICAL DISCHARGE FAN. Page 145. A vertical discharge fan for removing a large volume of fumes or air at high velocity. The fan is fabricated of zinc-coated iron sheet with welded construction throughout. Available as direct drive with motor mounted inside air stream or with motor mounted outside throat of ventilator. Catalog available.....Item 238

SEAMLESS DRAWN COPPER TUBES. Page 77. Made up to 26 inches ID, in long lengths, copper tubes are light, cannot rust, and smaller sizes can be bent right on the job. Smooth interiors often result in lower pumping costs. Copper piping can be taken down, moved or have new connections cut in rapidly with solder-type fittings. .....Item 239

SECTIONAL DUCT FURNACE. Page 38. Capacities to over 2-million Btu per hr, each section is complete with controls and built-in draft diverter. Sections can be operated independently to meet less than peak load requirements. Sections may be installed side-by-side in a single bank or back-to-back in a double bank. Bulletins available. .....Item 240

POWDER FIRED FASTENERS. Page 161. How costs can be controlled by powder actuated fasteners for fastening into steel and concrete. Data sheets and bulletin available. .....Item 241

PUSH-BUTTON AIR CONDITIONING. Pages 18-19. Fully automatic refrigeration unit, up to 400-ton capacity, starts at the touch of a button. All working parts are hermetically sealed inside a housing. The unit modulates from 100% down to 10% of capacity. Made in sizes from 45 to 400 ton capacity. .....Item 242

CUSTOMIZED TANKS. Page 157. Tanks and boilers are custom fabricated and lined. Suggestions are offered for fabrication and lining economies. Literature available. .....Item 243

FAN COOLERS. Page 14. Eliminate water problems by using fan coolers for any size compressor, regardless of tonnage. Stands, hoods and wind deflectors are available for simplified outside mounting. Bulletin available. .....Item 244

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MAKE USE OF EXHAUST STEAM. Back cover. Where low pressure steam is required, economical exhaust steam often can do the job just as well. Automatic hookup of two valves and a pressure regulator provide exhaust steam whenever it is available. Live steam is consumed only when it is actually needed. Bulletins and catalog are available. .....Item 245

UNIT OIL HEATERS. Page 182. A unit heater with 80% efficiency has a gun type burner. Its high efficiency eliminates smoke. The heater delivers 140,000 Btu per hr and has a 50-ft throw. With thermostatic controls it can be used as a fan in summer. One plant has 90 heaters operated off one 1-inch oil supply line, in two loops. Data available. .....Item 246

BLOWER FANS. Pages 24-25. Fifty powerful blower fans are installed in modern airport terminal building. Thirty-four of the fans service 317,000 sq ft and have a total capacity of 285,000 cfm. The ventilating system also includes heating and ventilating units, heating and cooling units, and utility sets. .....Item 247

CABINET HEATING UNITS. Page 59. Some models heat with hot water and cool with chilled water, others are for steam or hot water heating only. They are made in 3 enclosure types with capacities from 120 to 640 sq. ft. EDR. Four illustrations of many hundreds of efficient, attractive installations. Bulletin available....Item 248

LOW SURFACE TEMPERATURE INDICATOR. Page 185. This instrument can read most low surface temperatures in 3 to 5 minutes. It is a direct reading instrument with no conversion tables, balancing slide wires or batteries necessary. Bulletin available. .....Item 249

VACUUM HEATING PUMP. Page 60. This pump features a multi-orifice nozzle vacuum producer. The vertical motor mounting places the ball bearings and electrical windings above dirt and water. The pump will handle near boiling water without vapor binding or cavitation. All vital parts, including the pump assembly, can be readily inspected without disturbing the piping. Catalog available. .....Item 250

RADIATOR VALVES AND TRAPS. Page 62. This company's radiator valves and traps were installed throughout New England's largest housing development. The low pressure heating system services 27 buildings and a total of 2,000 rooms. Catalog available. .....Item 251

STEEL PIPE. Page 40. The qualities of this steel pipe are enumerated as uniformity, easy cutting and threading, it coils and bends well, makes sound joints, is strong, its manufacture is rigidly controlled, and the pipe is thoroughly tested, constantly improved and has gained nationwide acceptance. .....Item 252

MONOLITHIC PIPE INSULATION. Page 55. A fast economical way to install then insulate underground heated piping. No pre-formed sections are required. The concrete is poured directly around pipes after they are welded and tested, leaving no joints or voids to leak heat. Booklet available. .....Item 253

LOW VELOCITY DIFFUSERS. Page 44. These diffusers are designed and engineered for easy installation and to handle high loads and high ventilating requirements, with a uniform low rate of room air motion. They meet the most exacting demands of industrial processing and scientific research. Literature available. .....Item 254

REFRIGERATION COMPRESSORS. Page 58. Are you handling one of the Freons, or ammonia, or some other refrigerant. At what temperature. Whatever your load, this company's machines are built to meet every commercial and industrial requirement. Information available. .....Item 255

ONE PUMP WITH SIX MOUNTINGS. Page 58. A single air conditioning pump that can be mounted by six different methods. You can get a single set of operating characteristics using four different models that can be installed in any of six different ways. Bulletins are available. .....Item 256

FIBERGLAS PIPE INSULATION. Page 61. This pipe insulation comes pre-formed in sections to fit standard pipe up to 12 inches in diameter; all copper tubing up to 3 inches. Finishes, including vapor barrier for anti-sweat cold water applications, are factory applied. Technical bulletin available. .....Item 257

HEATING AND COOLING REGISTERS. Page 148. These registers eliminate blasts, hot spots, and cold corners by diffusing air 4-ways for complete 360 degree heating and cooling comfort. Literature available. .....Item 258

COPPER TUBE WHOLESALERS. Page 41. This company salutes the alert operation and skilled warehouse management of the wholesalers who distribute their tubing. Get acquainted with your wholesaler and let him help you build a better business. .....Item 259

EQUIPMENT USED IN PROJECTS. Page 143. Eighty-seven per cent of one city's 52 biggest postwar projects that use such equipment, use this company's instantaneous hot water heaters, storage water heaters, preheaters, condensate coolers, converters or Freon coolers.....Item 260

FINNED COILS. Page 134. Copper and aluminum finned coils, used either for evaporators or condensers, are made by automatic machinery in entire sections. In this company's new modern plant, production schedules for any manufacturer or contractor can be made on a delivery-on-time basis. Bulletin available. .....Item 261

ARMORED VALVE SEAT. Page 31. Plug type valves with plug and seat ring made of a chromium alloy stainless steel, heated to 500 Brinell hardness. Seating surfaces offer highest resistance to galling, cutting, abrasion, and erosion. .....Item 262

WELDED MOTOR-COMPRESSORS. Page 69. Heavy-duty, high-power-factor motor delivers power aplenty with minimum current consumption. Freon-12 and Freon-22 models available. Use of Freon-12 can give you as much as 75 deg F lower temperatures in windings, crankcase, oil and discharge side. Information available. .....Item 263

AUTOMATIC ROOM HEATERS. Page 43. Thermostatically controlled room heating units only 12 inches high can be recessed into the wall. Three sizes are made: 6,000, 12,000, and 18,000 Btu output. No electric wiring or power is used. Small flexible copper tubes carry steam to each room unit. Booklet available. .....Item 264

ALUMINUM ROOF VENTILATORS. Page 78. This new belt-drive eliminates heavy roof loads. Made in sizes from 1,000 to 12,-

Use this Digest to locate and refer to advertisements appearing in this issue of AIR CONDITIONING, HEATING AND VENTILATING, then fill out and mail the prepaid postcard to request further information.

000 cfm, the 12,000 cfm size weights only 250 lb. Only a 6-inch high roof curb is needed, and the entire shell can be lifted off by removing four bolts. By lifting the hinged hood, motor and belt-drive are accessible for inspection. Catalog available. .....Item 266

HEATING SYSTEM CATALOG. Page 42. Presenting the last word in equipment for forced hot water and service water heating systems. In this comprehensive catalog, you'll find a complete line of equipment, including new and improved items for better heating. .....Item 268

FLOAT CONTROL VALVES. Page 147. These heavy duty, large capacity water level controls are float control diaphragm valves especially designed for air conditioning equipment, evaporative coolers, air washers, etc. Water can be discharged upward or downward as specified. Information available. .....Item 267

AIR DIFFUSERS. Page 128. Installed as a continuous strip in window head or sill, this is the only practical means for air curtaining plate glass windows or wall areas to counteract summer heat or winter chill. It is available as a continuous decorative unit, or in sections to meet any requirements of interior treatment. .....Item 268

STORAGE WATER HEATERS. Page 75. Storage water heaters are manufactured in both horizontal and vertical types. The removable heating element consists of U-shaped seamless copper tubes, roller expanded into a carefully drilled tube plate. The tanks are fabricated from flange-quality carbon steel, stainless-clad or nickel-clad steel, or copper-silicon alloy. Bulletin available. .....Item 269

AIR CONDITIONING CABINETS. Page 51. Horizontal and vertical units are of heavy duty construction and can be placed directly on the floor or suspended. The mixed-flow fans are much more efficient than forward curve wheels and can be operated at higher pressures and speeds at lower noise level. Bulletin available. .....Item 270

STEEL PIPE. Page 62. Steel pipe is stocked for fast service to you. Nearby distributors of this company's pipe carry a complete stock of good steel pipe and will deliver your order quickly. It saves you time delays on jobs and the expense of carrying costly, excess inventory. .....Item 271

Circle numbers corresponding to the advertisements in which you are interested, print your name and address clearly. Information will be sent directly from manufacturers.

PLEASE SEND US MORE INFORMATION

Circle below item numbers on which you wish further information.

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215	216	217	218	219	220	221	222	223	224	225	226	227	228
229	230	231	232	233	234	235	236	237	238	239	240	241	242
243	244	245	246	247	248	249	250	251	252	253	254	255	256
257	258	259	260	261	262	263	264	265	266	267	268	269	270
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CHECK BEFORE YOU ORDER. Page 147. One customer has always checked with this company on any problem involving heat exchangers. Manufacturers of heat exchangers for the heating, piping and air conditioning contractor, they are represented in all principal trading areas. Catalog available. .....Item 273

HEADS FROM 6 TO 650 FEET. Page 139. Neither height, capacity, nor horsepower rating are objects. A newly expanded pump line with over 200 standard models, covering capacities from 5 to 2,000 gpm and heads to 650 ft is available for practically all normal air conditioning requirements. Three classes of pumps range from 1/3 to 150 hp. .....Item 272

WATER HEATING-COOLING SYSTEMS. Page 44. A new unit is designed for cooling and heating the peripheral zone of office buildings, hotels, and other buildings which use interior ventilation systems. Available in 200, 300, 400, and 600 cfm sizes, and designed for total recessing, the unit has a three-speed fan control which provides a wide range of air quantities and heating and cooling capacities. .....Item 274

BOILER PUMP CONTROL. Page 41. A pump control with the ability to stand up under the pressure and temperature of laundry and cleaning plant operation is provided with a second switch for cutting off burner and sounding low water alarm in the event of an emergency. Packless construction is provided by extra-heavy monel bellows. Float has extra-heavy shell and entire mechanism is sealed to prevent tampering. Installation instructions available. .....Item 275

STEAM TRAPS. Inside front cover. This low pressure heating system trap has the same design, materials and workmanship as traps for 900 lb pressure and 900 deg F systems. Condensate is discharged at steam temperature as soon as it reaches the trap. An article and a 44-page book are available. .....Item 276

PERIMETER HEATING. Page 2. Forced hot water heating with baseboards is practical even in lowest-cost developments because it requires minimum of piping, auxiliaries and controls. The heating element combines heating unit and main, concealed behind unobtrusive base board ...Item 277

MECHANICAL LUNGS. Page 134. Highly flexible in purpose or position, this backward blade centrifugal fan is designed for use in heating, ventilating and air conditioning systems, power plant installations and industrial processes. .....Item 278

PACKLESS CONTROL VALVES. Page 13 and 164. On many heating and air conditioning systems, valves outnumber thermostats 1½ to 3 times. These packless valves are made with a rugged cast aluminum top, have minimum valve stem friction, require no packing nut or gland to be tightened, oiled or adjusted, and have no binding of valve stem. Bulletin available. .....Item 279

HIGH VELOCITY AIR FILTERS. Page 149. The filter media has special hemmed edges for strength and safe, easy handling. They have a maximum efficiency of 250 to 510 fpm. Low velocity and grease filters are also made. Catalogs available. ...Item 280

INDUSTRIAL STEAM BOILERS. Page 12. Twin 500 hp steam boilers furnish steam for processing and heating a new 100,000 sq ft plant. A forced draft fan delivers air to concentric rows of guide-vanes which direct the air in a spinning stream into the burner. This technique results in a high rate of heat transfer to the surrounding water-cooled furnace. Bulletin available. .....Item 281

HOT WATER HEATING EQUIPMENT. Page 67. Air vents, radiators, valves, expansion tanks, circulators, every hot water specialty you need from one complete line. You can specify this company's products for every spot on a hot water heating system and save time from buying to billing. Bulletins available. ...Item 282

WATER PRESSURE RELIEF VALVES. Page 170. A non-metallic disc-to-metal seated, A.S.M.E. steam rated hot water pressure safety relief valve provides over 875,000 Btu per hr at 30 lb setting. They are offered in a complete range of sizes from ¾ to 2 inches inclusive. .....Item 283

HEATING AND VENTILATING UNITS. Page 165. Compact, versatile units can be horizontally or vertically suspended or floor mounted. Choice of coil units, discharge patterns, filter sections, manual or automatic damper controls, steam or hot water circulation. Ratings from 60,000 to 1,260,000 Btu/hr and 1,200 to 21,000 cfm. Folders available. .....Item 284

ROUND CEILING DIFFUSERS. Page 54. Air diffusers, with a hidden yet easily accessible adjusting mechanism, have an integral volume control from full open to shut-off. In these units air patterns are adjustable after installation from vertical to horizontal discharge. Literature available. .....Item 285

CENTRIFUGAL REFRIGERATION SYSTEMS. Page 30. A 315-ton centrifugal refrigeration system, along with air handling equipment and pumps, carries the entire cooling load for an air terminal's 3-million cu ft of space. Information available. .....Item 286

INDUSTRIAL HEATERS. Page 7. Rugged industrial heaters available in 24 sizes, 5 coil selections, 150 ratings from 100,000 to 2,500,000 Btu per hr and 2,000 to 25,000 cfm each. General purpose heaters with non-ferrous heating coils and heavy-duty heaters with wrought iron heating coils. Information available. .....Item 287

VENTILATING LINE. Page 39. Power roof ventilators, blowers, furnace fans, unit heaters propeller fans, universal blowers air conditioning units, and ventilating sets are included in this company's line of products. Bulletins on each are available. .....Item 288

SILENT DUCT. Page 68. Choice of 24 or 26 gage steel fastened to canvas, asbestos, or neoprene-coated fibre glass for air ducts is offered. This duct material comes in 100-ft coils in handy dispenser carton. Descriptive literature available....Item 289

RESIDENTIAL OR COMMERCIAL TYPE TOWERS. Page 137. The wetted deck surface of these cooling towers is guaranteed against rotting or fungus attack for 20 years. They are equipped with stainless steel fans, sheet steel cabinets hydraulically painted with vinsynite, vinyl zinc and chlorinated rubber. Detail specifications available. .....Item 290

RADIANT PANEL HEATING IN CHURCH. Page 133. Five thousand feet of copper water tube in sizes ranging from ¾ to 1¼ inches was used in the radiant panels of this church. Only one solder or compression fitting was needed every 60 ft. Technical advisory service available....Item 291

SILL RADIATORS. Page 9. Perimeter radiation, installed at any height, has capacities from 2.9 to 11.1 sq ft and is made in four cabinet sizes from 2 to 8 ft. Complete accessories are also made to meet all practical installation needs. Publication available. .....Item 292

CONTINUOUS AND CYCLING FLOW CONTROLS. Page 74. Steam heating flow control systems have a single dial control that balances heat supply against heat loss in mild or severe weather. Both types are recommended for zoned control applications. Bulletins available....Item 293

ALUMINUM INSULATION. Page 5. Multiple accordion aluminum insulation has a heat ray absorptivity of 5%, reflectivity of 97%, and an emissivity of 5%. In winter, the properties of this aluminum insulation make it a 3-fold bar to outward heat flow. Bureau of Standards report made available by company. .....Item 294

HELP IN PLANNING. Page 73. Help in planning commercial and industrial air conditioning is made possible by a complete range of equipment, the advice of experienced engineers, and a Nationwide service organization. Information about the service is available. .....Item 295

WELDING TEES. Pages 33-34. These welding tees are drawn from seamless tubing to a barrel shape thereby producing high strength. This offers a complete line of welding fittings and flanges, including more than 4,000 items, in all piping materials, schedules and sizes. Booklet available. .....Item 296

CONCEPT OF AIR CONDITIONING. Page 36. This company's method is to select and engineer each air conditioning system to fit the particular building in which it is installed. Seven of this company's refrigerating compressors supply cooling for 573 ceiling-mounted air-handling units in a new Florida hotel. .....Item 297

POWER PLANT DRAFT INDUCER. Page 48. Package draft inducers available in many sizes and in motor or turbine drive save space in power plants. The motor and fan are designed as one complete unit which makes installation easier. Inlets are interchangeable to top, bottom or sides. .....Item 298

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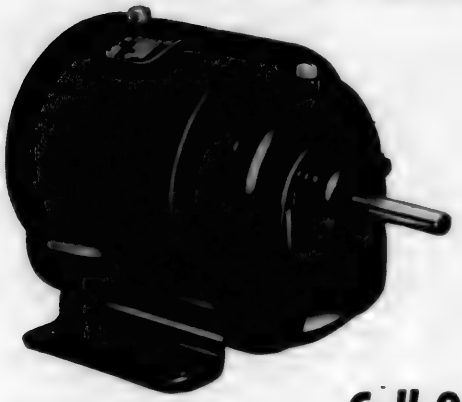

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AIR POLLUTION ABATEMENT

(*Continued from page* 150)

petroleum gas fuel, such as propane, to minimize fume emissions.

(4) Development of equipment to minimize fumes from spillage and other causes at gasoline stations.

(5) Elimination of open-air refinery adjuncts such as "skimming ponds" and petroleum waste pits.

(6) Elimination of fumes from trucks transporting gasoline.

The Los Angeles county board also set up a panel of 15 scientists to draft criteria for the operation of a smog warning system.

In the first of three phases contemplated for the warning system, when a smog accumulation began getting severe, variance permits allowing some industrial plants to exceed the basic limits of pollution emission would be canceled, and backyard incineration would be stopped.

During the second phase of smog severity, all industries would be required to curtail operations to decrease fumes. In the third phase, all industries emitting fumes would be stopped from operation; and all traffic, except emergency vehicles, also would be halted.

The Los Angeles supervisors further had under consideration a $2 million smog research program for 1955 proposed by the Southern California Air Pollution Foundation.

Established by business and civic leaders to complement the work of the Los Angeles County Air Pollution Control District, the foundation reported after a year's preliminary study that industry bore only secondary responsibility as a smog source, and that about twice as much pollution was attributable to the area's millions of automobiles and back yard incinerators.

EXPOSITION

of heating, ventilating and air conditioning equipment breaks records at Philadelphia.

Exhibits at the 12th International Heating and Ventilating Exposition presented the largest array of its kind ever assembled. Over 400 exhibitors offered five acres of demonstrations and displays occupying all of the available space at Philadelphia's Commercial Museum and Convention Hall, January 24 to 28. The exposition was sponsored, as heretofore, by The American Society of Heating and Air Conditioning Engineers in conjunction with its annual meeting, the 61st. Technical improvements were prominent in all departments of the show.

• **AIR CONDITIONING.**—One manufacturer of central heating equipment offered a hide-away cooling unit teamed up with a hot water baseboard radiant heating system. A manufacturer of packaged air conditioners offered as an option accessory heating coils, available to provide warm, filtered air in winter. The equipment is designed for business uses, styled for stores, offices or factories, and may be used as an adjunct to basic heating. It features a hermetic condensing unit, and carries a 5-year warranty on the complete refrigeration cycle. One large exhibit embraced multi-room, multi-story building air conditioning, residential heating and air conditioning, industrial heating, ventilating and air conditioning; equipment for the process industries, and finally, for transportation in the way of railway car and truck refrigeration, railway passenger car and motor bus air conditioning, and aircraft heat transfer. This exhibit featured a 400-ton capacity centrifugal refrigeration compressor in operation without special base or supports.

• **FANS.**—Another exhibitor staged an assembling contest throughout the week. This display featured a new universal blower, so called because it is, in fact, an assortment of parts capable of being assembled in different wys to meet various requirements. There were numerous exhibits of air moving equipment in all sizes and styles. A manufacturer of centrifugal fans and blowers, attic fans and acid-resistant fans, demonstrated a new acid-resistant coating, said to outlast any other coating process yet developed. A direct-drive blower, new in the industry, was on view at another booth, together with a belt-driven blower having a four-way discharge. At another booth, an entirely new line of 15- to 37-inch belt-driven low-contour spun aluminum roof exhaust fans was shown. There was also an exhibit of centrifugal power roof exhausters designed to handle high static pressures.

• **FILTERS.**—Among several displays of air cleaning equipment was a washable, self-charging electrostatic air cleaner. This filter is based on the fact that certain plastics, resins and waxes, when subjected to an air stream, develop an electrostatic charge sufficient to attract and retain particles of dust, smoke and soot. The filtering medium is shredded polyethylene packed in conventional filter panels. When clogged it is cleaned by rinsing in clear cold water. Another exhibitor's electrostatic precipitator for industrial use is now provided with a semi-automatic washer, which permits the assembly to be serviced in place, instead of being dismounted for cleaning. An accessory unit, which can be supplied with the exhibitor's standard filter equipment, is designed to flush the collector plates with water from traveling jets, and—after drying—recoat them with the necessary adhesive oil film by spray from the same jets.

• **HEATING.**—Among exhibits for the heating trade, there was a line of oil burner ignition transformers to which have been added two new transformer bodies and three interchangeable bases. The complete line includes seven transformer bodies, 16 interchangeable bases and four terminal accessories. This assortment permits the replacement of over one thousand different makes and models of oil burners in use today, the exhibitor said. A new product for the trade is a line of basic check units—the working parts of a check valve—which, in combination with standard pipe fittings, forms a complete, made-to-order check valve—handy to save time on the job.

A special snap-lock design was featured in a display of air distribution duct fittings, including a ready-made solution of the problem of fitting boots for register openings in close quarters; also shown were fittings to simplify the tie-in of gas furnaces and water heaters on

(*Continued on page* 160)

"MAGNETIC COUPLING"
Exclusive Feature of
DWYER
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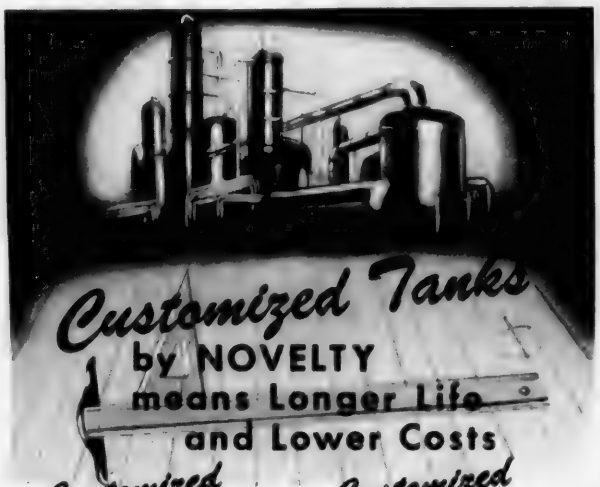

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Niagara District Engineers in Principal Cities of U. S. and Canada

DEGREE-DAYS FOR DECEMBER, 1954

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city.

AIR CONDITIONING, HEATING AND VENTILATING's 27th Year of Publication of Monthly Degree-Day Data

City	December			Season to Dec. 31, incl.*		
	1954	1953	Normal	1954-55	1953-54	Normal
Abilene, Texas (A)	482	629	595	856	1067	1098
Albany, New York (A)	1142	973	1197	2406	2202	2559
Albuquerque, New Mexico (A)	889	989	899	1523	1728	1757
Alpena, Michigan (C)	1233	1073	1218	2697	2462	2827
Anaconda, Montana (C)	1175	1112	1238**	2843	2529	3171**
Asheville, North Carolina (C)	859	801	769	1823	1611	1633
Atlanta, Georgia (A)	652	649	614	1257	1113	1125
Atlantic City, New Jersey (C)	857	688	831	1589	1333	1597
Augusta, Georgia (A)	594	562	494	1156	1033	835
Baltimore, Maryland (C)	845	686	812	1553	1298	1537
Billings, Montana (A)	944	990	1172	2262	2061	2739
Binghamton, New York (C)	1102	896	1113	2302	2048	2417
Birmingham, Alabama (A)	652	662	596	1228	1148	1128
Bismarck, North Dakota (A)	1237	1279	1535	2964	2746	3458
Block Island, Rhode Island (A)	889	719	927	1784	1535	1936
Boise, Idaho (A)	1062	1039	1054	2274	2071	2340
Boston, Massachusetts (A)	941	761	998	1908	1596	2008
Bozeman, Montana (C)	1238	1120	1293**	2875	1448	3286**
Buffalo, New York (A)	1117	937	1116	2299	2028	2424
Burlington, Iowa (A)	1070	1041	1150	2175	1997	2334
Burlington, Vermont (A)	1290	1033	1308	2740	2387	2859
Butte, Montana (C)	1303	1170	1261**	3079	2722	3183**
Cairo, Illinois (C)	768	791	784	1447	1400	1465
Charleston, South Carolina (C)	468	375	410	790	649	658
Charlotte, North Carolina (A)	713	673	682	1378	1185	1274
Chattanooga, Tennessee (A)	761	754	710	1497	1371	1380
Cheyenne, Wyoming (A)	1001	1147	1125	2404	2537	2840
Chicago, Illinois (C)	982	988	1074**	1942	1800	2172**
Cincinnati, Ohio (C)	856	843	880	1657	1533	1711
Cleveland, Ohio (A)	1014	948	1057	2050	1883	2171
Columbia, Missouri (A)	906	887	989	1769	1643	1967
Columbia, South Carolina (A)	630	516	524	1205	874	908
Columbus, Ohio (C)	979	871	983	1903	1617	1995
Concord, New Hampshire (A)	1192	1008	1271	2638	2363	2839
Concordia, Kansas (C)	910	917	1029	1742	1753	2048
Dallas, Texas (A)	461	594	518	802	962	870
Dayton, Ohio (A)	1021	984	1032	2072	1882	2122
Deer Lodge, Montana (C)	1271	1121	1331**	3127	2770	3518**
Denver, Colorado (A)	934	1033	1032	2016	2058	2348
Des Moines, Iowa (A)	1094	1103	1203	2212	2072	2455
Detroit, Michigan (A)	1088	964	1101	2214	1940	2325
Devils Lake, North Dakota (C)	1356	1513	1668	3289	3114	3795
Dodge City, Kansas (A)	853	937	980	1665	1770	1951
Dubuque, Iowa (A)	1228	1212	1290	2591	2395	2765
Duluth, Minnesota (C)	1378	1487	1550	3369	3205	3533
Elkins, West Virginia (A)	(a)	973	995	(a)	2296	2255
El Paso, Texas (A)	580	784	626	934	1199	1086
Ely, Nevada (A)	1208	1262	1181	2822	2816	2864
Escanaba, Michigan (C)	1195	1185	1321	2799	2610	3056
Evansville, Indiana (A)	863	895	871	1735	1700	1715
Fargo, North Dakota (A)	1398	1556	1615	3169	3043	3538
Fort Smith, Arkansas (A)	689	758	698	1232	1337	1273
Fort Wayne, Indiana (A)	1060	1019	1122	2204	2051	2365
Fort Worth, Texas (A)	464	615	533	817	1004	890
Fresno, California (A)	650	587	580	1104	1006	1011
Galveston, Texas (C)	192	337	271	291	461	402
Grand Junction, Colorado (A)	1195	1166	1132	2213	2151	2293
Grand Rapids, Michigan (A)	1133	1012	1169	2406	2172	2597
Green Bay, Wisconsin (A)	1288	1218	1392	2875	2573	3035
Greensboro, North Carolina (A)	830	763	772	1671	1422	1513
Greenville, South Carolina (A)	728	665	648	1404	1136	1200
Harrisburg, Pennsylvania (A)	973	842	964	1964	1759	1971
Hartford, Connecticut (A)	1014	862	1082	2147	1886	2266
Hatteras, North Carolina (C)	566	426	481	893	713	788
Havre, Montana (C)	1018	1112	1383	2499	2405	3240
Helena, Montana (A)	1295	1032	1311	3039	2479	3247
Houston, Texas (C)	216	396	303	365	549	465
Huron, South Dakota (A)	1321	1393	1407	2752	2660	3003
Indianapolis, Indiana (A)	1010	990	1051	2065	1912	2141
Jackson, Mississippi (A)	505	583	503	942	972	882
Kansas City, Missouri (A)	864	890	970	1596	1576	1875
Knoxville, Tennessee (A)	813	789	744	1592	1415	1454
La Crosse, Wisconsin (A)	1253	1201	1380	2676	2355	2900
Lander, Wyoming (A)	1214	1231	1383	2733	2652	3309

(a) Data not available.
*Heating season, cumulative, from Sept. 1.
**Same normal figures as previously listed by HEATING AND VENTILATING since new figures are not available. All other normal figures in this table are based on a 30-year period covering 1921 to 1950, inclusive, recently compiled and published by the U. S. Weather Bureau.

Figures in this table, with eight exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y., and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively; Anaconda, Bozeman, Butte, Deer Lodge and Livingston, Mont., through the courtesy of the Montana Power Company. Tacoma figures through the courtesy of the Tacoma News Tribune.

[Table concluded on opposite page]

Degree-Days for December, 1954 (Concluded)

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city

AIR CONDITIONING, HEATING AND VENTILATING's 27th Year of Publication of Monthly Degree-Day Data

City	December			Season to Dec. 31, incl.*		
	1954	1953	Normal	1954-55	1953-54	Normal
Lansing, Michigan (A)	(a)	1031	1175	(a)	2219	2583
Lewiston, Maine (O)	1146	1041	1295**	2660	2552	2837**
Lincoln, Nebraska (C)	974	997	1113	1947	1922	2243
Little Rock, Arkansas (A)	635	701	654	1139	1202	1179
Livingston, Montana (C)	1037	1073	1117**	2637	2353	2731**
Los Angeles, California (C)	213	188	253	324	303	451
Louisville, Kentucky (A)	862	883	871	1714	1636	1733
Lynchburg, Virginia (A)	857	791	809	1752	1487	1625
Macon, Georgia (A)	532	517	481	1006	905	824
Madison, Wisconsin (C)	1211	1153	1287	2532	2281	2707
Marquette, Michigan (C)	1213	1190	1299	2902	2588	3011
Memphis, Tennessee (A)	670	712	673	1265	1260	1248
Meridian, Mississippi (A)	564	620	528	1049	1049	956
Milwaukee, Wisconsin (A)	1137	1119	1218	2360	2220	2611
Minneapolis, Minnesota (A)	1281	1329	1414	2764	2509	2990
Moline, Illinois (A)	1108	1078	1181	2283	2099	2426
Montgomery, Alabama (A)	559	549	491	1026	928	864
Nantucket, Massachusetts (A)	870	727	924	1827	1625	2022
Nashville, Tennessee (A)	768	793	725	1496	1425	1372
New Haven, Connecticut (A)	967	842	1026	2009	1835	2145
New Orleans, Louisiana (C)	270	358	283	453	500	429
New York, New York (C)	898	746	908	1724	1411	1771
Newark, New Jersey (A)	916	797	961	1804	1560	1912
Norfolk, Virginia (A)	727	593	688	1318	1101	1257
North Platte, Nebraska (A)	1065	1152	1172	2377	2412	2563
Oak Ridge, Tennessee (C)	840	837	(a)	1685	1550	(a)
Oakland, California (A)	509	427	508	985	909	1077
Oklahoma City, Oklahoma (A)	724	769	747	1269	1344	1367
Omaha, Nebraska (A)	1025	1013	1166	1995	1882	2368
Parkersburg, West Virginia (C)	(a)	854	896	(a)	1712	1824
Peoria, Illinois (A)	1046	1045	1128	2115	1992	2312
Philadelphia, Pennsylvania (C)	857	716	856	1627	1341	1624
Phoenix, Arizona (A)	336	479	360	389	638	555
Pittsburgh, Pennsylvania (C)	952	827	924	1891	1642	1890
Pocatello, Idaho (A)	1360	1152	1184	2848	2365	2727
Portland, Maine (A)	1160	982	1237	2624	2377	2776
Portland, Oregon (C)	691	610	701	1525	1326	1600
Providence, Rhode Island (A)	976	817	1035	2036	1845	2195
Pueblo, Colorado (A)	905	1008	1051	1883	1975	2279
Raleigh, North Carolina (A)	767	619	651	1499	1119	1166
Rapid City, South Dakota (A)	1005	1063	1218	2342	2159	2802
Reading, Pennsylvania (C)	924	786	936	1842	1601	1866
Red Bluff, California (A)	672	473	564	1110	887	942
Reno, Nevada (A)	1007	993	986	2394	2220	2338
Richmond, Virginia (A)	826	691	791	1612	1359	1532
Rochester, New York (A)	1152	954	1141	2369	2097	2473
Roswell, New Mexico (A)	737	900	750	1344	1545	1415
Sacramento, California (C)	644	487	567	1103	875	980
St. Joseph, Missouri (A)	964	971	927	1842	1801	1809
St. Louis, Missouri (C)	850	797	893	1640	1423	1703
Salt Lake City, Utah (A)	1070	1086	1039	2184	2015	2279
San Antonio, Texas (A)	235	489	374	406	702	600
San Diego, California (A)	207	223	255	306	327	478
Sandusky, Ohio (C)	1002	927	1039	2006	1769	2116
San Francisco, California (C)	462	301	406	939	754	881
Sault Ste. Marie, Michigan (A)	1351	1253	1398	3153	2864	3340
Savannah, Georgia (A)	511	418	412	946	418	675
Scranton, Pennsylvania (C)	1055	880	1057	2194	1957	2254
Seattle, Washington (C)	645	617	679	1527	1453	1682
Sheridan, Wyoming (A)	1114	1093	1271	2564	2392	3045
Shreveport, Louisiana (A)	437	588	490	803	970	848
Sioux City, Iowa (A)	1144	1175	1290	2314	2255	2708
Spokane, Washington (A)	1072	978	1113	2568	2269	2705
Springfield, Illinois (A)	967	921	1017	1990	1689	1998
Springfield, Missouri (A)	871	867	908	1679	1603	1833
Syracuse, New York (A)	1152	926	1113	2338	2055	2340
Tacoma, Washington (C)	692	609	719	1624	1499	1850
Terre Haute, Indiana (A)	(a)	996	1023	(a)	1902	2076
Toledo, Ohio (A)	1072	983	1119	2221	2022	2364
Topeka, Kansas (C)	909	902	977	1664	1618	1891
Trenton, New Jersey (C)	915	776	930	1815	1565	1852
Tulsa, Oklahoma (A)	690	736	750	1192	1285	1382
Utica, New York (O)	1243	1008	1144**	2556	2224	2537**
Valentine, Nebraska (C)	1057	1124	1212	2394	2248	2709
Walla Walla, Washington (C)	891	691	890	1821	1524	1966
Washington, D. C. (C)	841	717	831	1634	1361	1604
Wichita, Kansas (A)	854	876	915	1547	1576	1763
Williston, North Dakota (C)	1171	1280	1528	2854	2706	3495
Winnemucca, Nevada (A)	(a)	1079	1085	(a)	2400	2595
Yakima, Washington (A)	1033	881	1066	2369	2085	2469

For footnotes, see page 158.

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mechanical
lungs!

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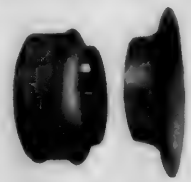

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EXPOSITION

(*Continued from page* 156)

a common flue. At another booth, there was a line of fittings for perimeter heating, plenum collars, scorch-proof connectors, and an all-snap, knock-down basement duct. In connection with a new line of roll-forming equipment a new snap-lock forming machine was introduced.

A display of warm air, hot water, steam and spray humidifiers included a demonstration of float and expansion type hot water heating system air eliminators, plus a new balancing valve adapter. To still another line of hot water heating specialties has been added an air eliminator designed for floor and ceiling panel systems, which is said to be based on a new theory. This unit, inserted in the feed line from the boiler, breaks the flow of water, causing the air to separate out.

Perimeter heating has become increasingly popular. By some of the equipment manufacturers, this is taken to mean warm air forced through diffusers on two or more sides of a room. To others, it means baseboard radiation, or radiation combined with convection currents. There has been a considerable expansion in offerings for ducts and fittings, as well as registers and grilles, to serve the first method of distribution, and a noteworthy influx of new baseboard designs, to serve the second.

• **REFRIGERATING.**—On the score of cooling appliances, there has been considerable activity over the past two years, with resulting innovations at the exposition. A well-known source of refrigeration equipment displayed a working model of a new square-finned cooling coil, kept frosted by a small refrigerating machine. A widely-known manufacturer of steam specialties is adding a new line of tube radiation. A manufacturer of automatic controls has gone into the production of coils for refrigeration and air conditioning. Another manufacturer of cooling and refrigerating equipment offered a preview of a new contour fin said to increase heat transfer on the air side of heating and cooling coils. The same exhibitor also presented a new design for small cooling towers distinguished by a plastic cabinet and sump pan, and a water-turbine-drive fan.

Among working demonstrations at the exposition were a model-sized draw bench, showing how copper tubing is cold-drawn to size. Another showed a metal-cutting band saw ripping through a stack of 50 galvanized sheets at one time. Friction cutting of stainless steel sheets was also demonstrated.

400-TON CENTRIFUGAL

operates in exhibition booth without special base; will be installed in store after show.

The Trane Company of La Crosse, Wisconsin, set a record by operating a complete 400-ton CenTraVac hermetic centrifugal refrigeration unit in its booth at the International Air Conditioning Exposition last month.

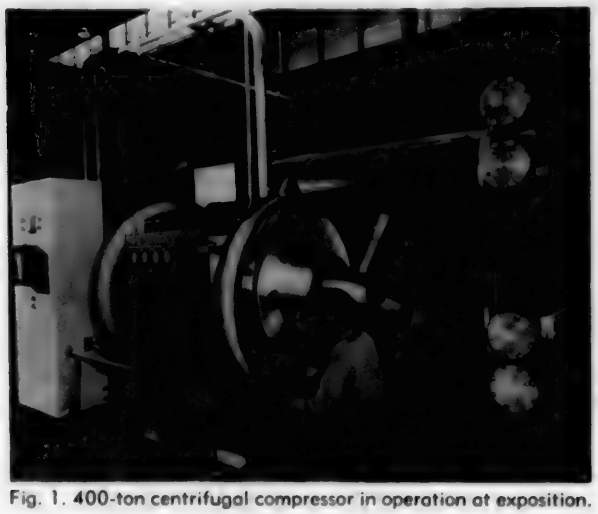


Fig. 1. 400-ton centrifugal compressor in operation at exposition.

The unit shown in Fig. 1 operated throughout the show, placed without a special base on the floor of the Commercial Museum in Philadelphia.

With the exception of a few minor changes for exhibition purposes only, the entire refrigeration system was set up at the show just as it will subsequently be installed in a large Sears Roebuck store in Upper Darby, Pennsylvania. The packaged unit consisted of a standard two-stage centrifugal compressor, a 2-pass condenser, a 2-pass evaporator, and a purge system. Using Freon 11, and based on 95F leaving condenser water, the system was capable of chilling about 1000 gpm of water to 45F for a total refrigeration capacity of just under 400 tons.

This tremendous cooling capacity was dissipated by interchanging a controlled portion of the water between the condenser and evaporator circuits.

• **CIRCUIT.**—Fig. 2 shows a schematic diagram of the piping and control circuits for the unique system designed for

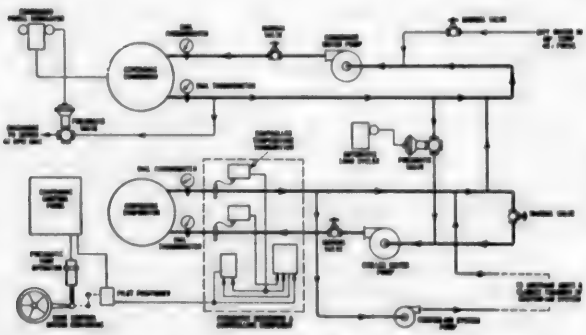


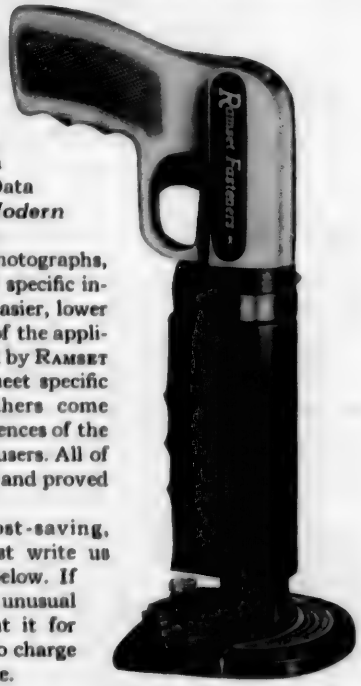
Fig. 2. Piping and control circuits for display systems.

the display. All controls were pneumatic and were supplied with 20 psi air. The quantity of chilled water interchanged between the chiller and the condenser was regulated by means of a pneumatic valve controlled by an automatic load cycler. This control contained a motor-driven cam mechanism which, in going through a 1½-hour cycle, varied the air pressure to the pneumatic valve, thereby allowing the flow of chilled water through the interchange

(*Continued on page* 162)

CONTROL YOUR COSTS with PROFIT ENGINEERING

Days of down time, hours of tedious labor, can be saved by using the practical suggestions for fastening into steel and concrete, contained in RAMSET Application Data Sheets and booklet, *Modern Fastening Methods.*



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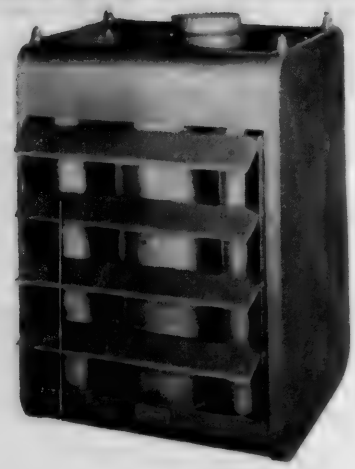

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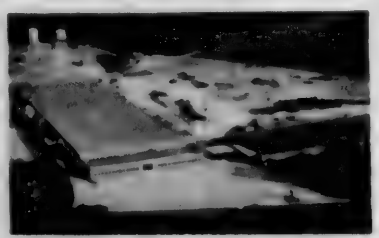
Thermostatic controls by Minneapolis Honeywell

Used as fan in summer

Autocar Division, White Motor Co. plant, Exton, Pa., uses 50 Interstate heaters . . . all operated off of one 1" oil supply line, in two loops.



SOME DISTRIBUTOR TERRITORIES STILL AVAILABLE

Write for Complete Data

Interstate

HEATER MANUFACTURING CO.

2627 W. 6th Ave., Denver, Colo.

400-TON CENTRIFUGAL

(*Continued from page* 161)

circuit to vary between 25 and 250 gpm and change the system load rapidly from maximum to minimum values.

In order to demonstrate how a complete chilled water system in a large building would actually operate, a small portion of the chilled water was supplied to three fan-coil air-handling units. The two UniTrane room conditioners which filter and cool recirculated air were actually mounted in small 7 ft by 7 ft simulated rooms or offices. In one room, a vertical cabinet unit was mounted on the floor under a window and in the other, a horizontal unit was furred into the ceiling near the room entrance. The third unit was a Climate Changer, which is normally installed centrally on each floor of a multi-story building. This unit provided filtered, cooled, and dehumidified primary air to the two model rooms through a central duct with small take-off ducts to each room.

• **CONTROLS.**—Enough city water was added to the condenser water circuit to dissipate heat of compression and heat from the water circulating pumps in the system. Since the requirement for this water varied with the load on the system, it was controlled by a Johnson Service pneumatic pressure regulator. As shown on the flow diagram, this regulator was actuated by condenser pressure and regulated a pneumatic valve in the waste water line to maintain constant condenser pressure.

The means of providing capacity control of the CenTraVac is by varying the position of inlet vanes ahead of both impellers, thereby controlling the flow of refrigerant gas into the compressor. The position of these vanes is controlled through a vane operator from a proportional type pneumatic temperature control in the leaving chilled water line.

• **POWER.**—As another feature of the display unit, power drawn by the 300-hp compressor motor was recorded to show that power requirements of the CenTraVac were reduced nearly proportionately with load reduction.

The 400-ton refrigeration system operated throughout the show on its automatic controls. It went through its preset 1½ hour load variation cycles without attendance or adjustment.

NUCLEAR CONGRESS

to bring industrial scientists and engineers together in co-sponsored conferences and exposition at year's end.

Under the leadership of Engineers Joint Council, a dozen organizations, representing more than 250,000 American scientists, engineers and industrialists have united in announcing a Nuclear Congress and Atomic Exposition to be held December 12-17, 1955, in Cleveland.

The Nuclear Congress represents the biggest single project yet undertaken by the combined engineering and scientific societies of the nation. In addition to covering the interrelations of all branches of the nuclear sciences

and engineering, both events have the active support of private enterprise and of government in the power and other atomic fields.

• **OBJECTIVE.**—Basic objective of the Congress is to launch a continuing program of interchange of information on the developing applications of nuclear science by the engineer for vital national benefits involving industry, agriculture, medicine and the public welfare.

Announcement of the Congress was made jointly by Dr. Thorndike Saville, president of Engineers Joint Council and Dean of Engineering at New York University; Dr. John R. Dunning, chairman of the General Committee on Nuclear Engineering and Science and Dean of Engineering at Columbia University; Dr. Donald L. Katz, chairman of the Nuclear Congress Program Committee and chairman of the Chemical and Metallurgical Engineering Departments at the University of Michigan. An exposition, to be held in connection with the Congress was announced by Prof. Barnett F. Dodge of Yale University and president of the American Institute of Chemical Engineers, direct sponsor of the Exposition.

• **SOCIETIES.**—Co-sponsors of the Congress include:

American Society of Civil Engineers
American Institute of Mining and Metallurgical Engineers
The American Society of Mechanical Engineers
American Water Works Association
American Institute of Electrical Engineers
The Society of Naval Architects and Marine Engineers
American Society for Engineering Education
American Institute of Chemical Engineers
American Chemical Society
American Institute of Physics
American Nuclear Society
Atomic Industrial Forum

In addition to the above, the Institute of Aeronautical Sciences and the American Geological Institute are expected to cooperate in the Congress program. Participation in the Congress is open to all major technical groups having an interest in nuclear engineering in any form.

Coordinating the complex organization of the Congress activities is the Engineers Joint Council through Brig. General Stewart E. Reimel (Ret.), EJC Secretary. The eight EJC member societies are included in the co-sponsors. Local arrangements in Cleveland for the Congress are being handled by the Cleveland Engineering Society, Ralph R. West, president.

AIR COOLED FERRY

takes passengers and automobiles from Key West to Cuba in air conditioned comfort.

The dream of many people materialized recently with the inauguration from Key West of the first automobile ferry service between the United States and Cuba. The need for this type of ferry service for passengers and automobiles between Key West and Cuba has existed for

(*Continued on page* 165)

NEW
WEINMAN
type AC centrifugal pump
for air conditioning systems

When outside atmospheres are laden with abrasive dust particles, recirculation of cooling water in air conditioning systems using cooling towers becomes a major maintenance headache. Shaft seals become worn far more quickly than normal and leakage occurs.

The Type AC pump was designed specifically by Weinman engineers to render long service under these conditions; in addition to a rotary type mechanical shaft seal, there is provided a reversible ceramic floating seat and carbon washer combination held by a stainless steel spring, insuring longer life and leakproof operation. The shaft is solid stainless steel, preventing rust or corrosion even when cooling water is chemically polluted.

CLOSE-COUPLED

MOUNTS IN ANY POSITION TO FIT REQUIREMENTS

Wherever thoroughly dependable, trouble-free circulation of hot or chilled water, pressure-boosting, or other general pumping needs are indicated, Weinman Type AC pumps will give superior service. If you have a pump problem, call your nearest WEINMAN Centrifugal Pump Specialist or write for Bulletin 725 . . . perhaps the Type AC pump is exactly what you need!

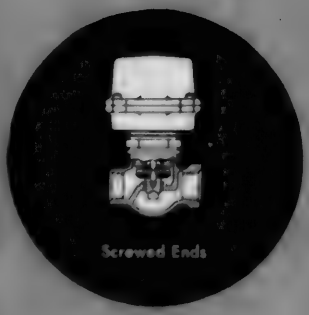
Representatives in principal cities.

Built by Centrifugal Specialists

POWERS

First with duo-seal

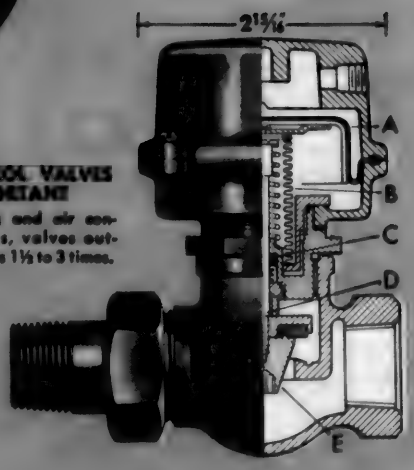
PACKLESS CONTROL VALVES



GOOD CONTROL VALVES ARE IMPORTANT

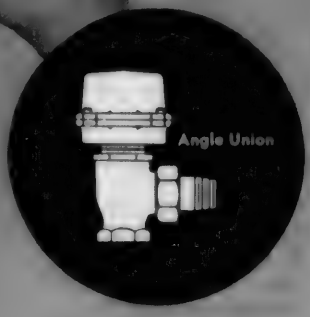
On many heating and air conditioning systems, valves outnumber thermostats 1½ to 3 times.

Available in Various Types and Sizes



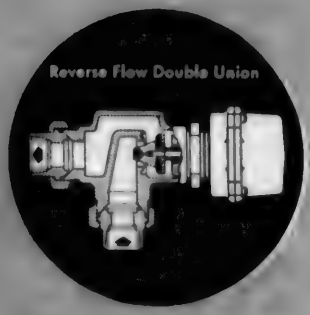
Rugged Cast Aluminum Top

A) Durable Molded Diaphragm
B) Bronze Bellows, Primary Seal
C) "O" Ring, Secondary Seal
D) Polished Stainless Steel Valve Stem
E) Characterized Throttling Nut



More ACCURATE Control with Powers PACKLESS Valves

Minimum valve stem friction. No packing nut or gland to be tightened, oiled or adjusted. No binding of valve stem as with conventional packing. Powers duo-seal construction assures better performance and—



No Packing Maintenance. No Leakage of Water or Steam. No Loss of Vacuum.

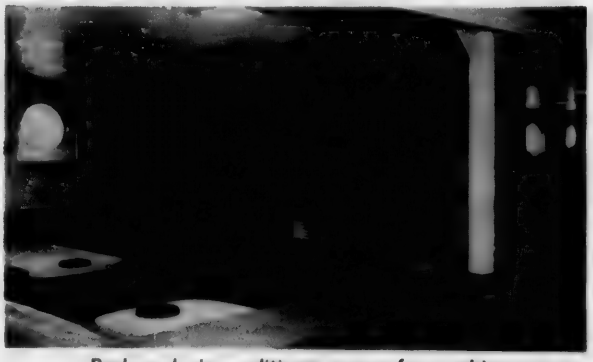
To insure getting a temperature control system with the best control valves made for convectors, unit air conditioners, unit ventilators, radiators, panel heating and cooling coils — specify or install POWERS control.

Call or write our nearest office for Bulletin 248

Established in 1891 • **THE POWERS REGULATOR COMPANY** • SKOKIE, ILL. • Offices in Over 60 Cities

AIR COOLED FERRY

(*Continued from page* 163)



Packaged air conditioner serves ferry cabin.

many years and has been especially apparent to travel agencies and the AAA which have received thousands of inquiries each season regarding such service.

The distance from Key West to Cuba is 90 miles. The distance from Miami to Cuba is about 220 miles. The ferry, making fifteen miles per hour, completes the trip in six hours. A vessel, running from Miami to Cuba, requires fifteen hours. The new ferry, christened City of Key West, operates on a regular weekly schedule leaving Key West on Tuesday, Thursday, and Saturday and departing from Cuba on Monday, Wednesday, and Friday.

The Navy-built ship is 203 feet long, 34 feet wide, and will accommodate forty cars and 250 passengers. More than a quarter of a million dollars was expended in converting and fitting the vessel for deluxe ferry service.

• **COOLING SYSTEM.**—In outfitting the ship, special attention was devoted to providing every facility for the relaxation, recreation and comfort of the passengers making the six-hour crossing. Features include a first-class restaurant, a cocktail lounge, and modern air conditioning. The air conditioning system consists of four Chrysler Airtemp 8-ton packaged units equipped with special corrosion resistant condensers. The units were split so as to permit the installation of the condensing sections below deck. Duct work was not required as the main deck of the "City of Key West" has been zoned with the four top halves (evaporator blowers) of the packaged air conditioners.

Powered by two 1,800-hp diesel engines, the vessel is operated by the Caribbean Ferry System.

NAVY'S LARGEST CARRIER

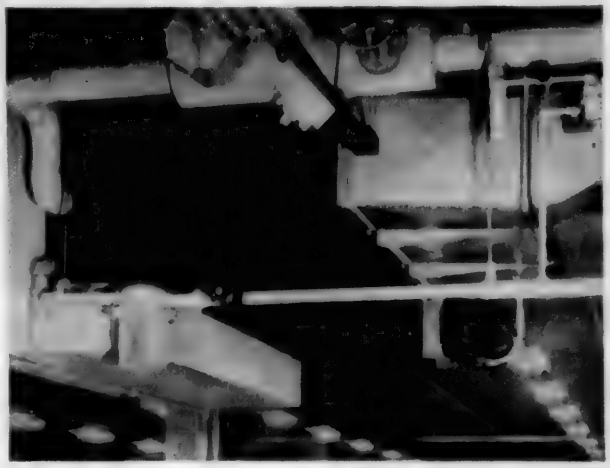
air conditioned for efficiency. U.S.S. Forrestal cooled by 1,050-ton centrifugal system.

The largest air conditioning system ever installed on a navy combat vessel will go into action in the newly christened U.S.S. Forrestal. Seven centrifugal refrigeration machines furnishing a total of 1,050 tons of cooling will

(*Continued on page* 166)

Carrier knows heating

Over fifty years of leadership in air conditioning have given Carrier unmatched experience in the control of temperature—heating as well as cooling. Yes, Carrier knows heating by experience—and all this engineering skill and leadership contributes to the superiority of Carrier Unit Heaters.

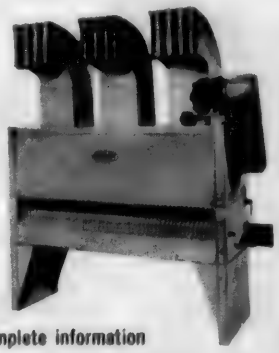


CARRIER HEATING AND VENTILATING UNITS

Compact, versatile units for large-area buildings, schools, auditoriums, gyms, garages, mills and factories of all types. Sectionalized construction adds flexibility to application, ease to installation. Can be horizontally or vertically suspended or floor-mounted. Choice of coil units, discharge patterns, filter sections, manual or automatic damper controls, steam or hot water circulation. Optional sound-deadening and vibration-isolation features. Ratings from 80,000 to 1,260,000 Btu/hr.; 1500 to 31,000 cfm.

CARRIER INDUSTRIAL HEAT DIFFUSERS

They distribute heat evenly at full or partial loads. Positive control of heat saves fuel through flow control of steam or hot water, or damper control of air. Sectionalized construction permits floor mounting, vertical or horizontal suspension. Sizes and arrangements for 115,000 to 1,620,000 Btu/hr.



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Carrier

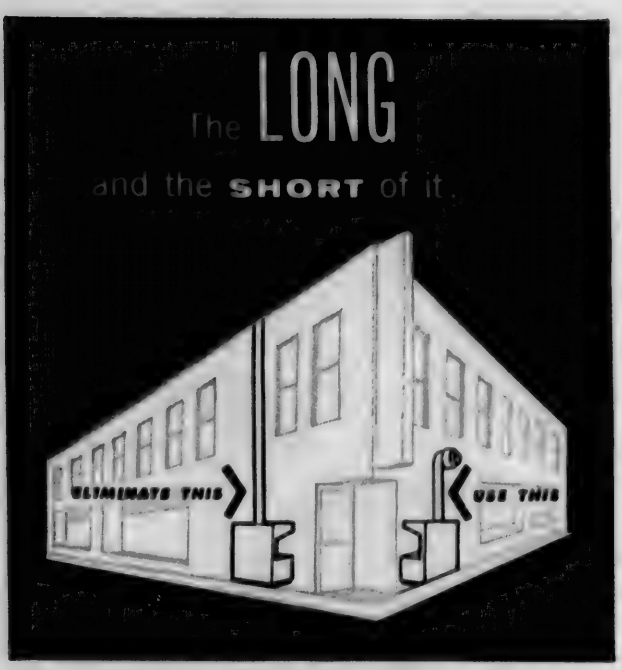
air conditioning
refrigeration
industrial heating

CARRIER CORPORATION, 306 S. Geddes St., Syracuse, New York
Please send folders on features and selection data for Carrier Heating and Ventilating Units and Heat Diffusers.

*Name*_____

*Business*_____

*Address*_____



. . . HOW TO CUT DUCT COSTS

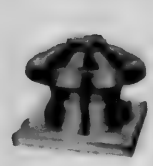
This is the story of how to save money on ventilating —the story of long duct runs vs. short ducts.

PROBLEM: To reduce long and elaborate duct runs connected to power exhausters—runs that often cost more than the heart of the system, the fan, itself. This problem is more acute in multi-story construction or existing structures where ducts are brought through upper floors to the roof.

SOLUTION: Use Jenn-Air Wall Exhausters . . . thus eliminating most duct work. One simple opening through the outer wall permits the Wall Exhauster to be connected directly to the area of ventilation. In this way valuable interior space is saved and installation costs are reduced.

The Long and Short of It on the Roof

JENN-AIR Wall Exhausters



Jenn-Air Low-Contour Roof Exhausters

Design blends with today's buildings. Gone are unsightly penthouses, and gravity stacks. First with spun aluminum construction, Jenn-Air Exhausters are setting the trend in the field.

JENN-AIR PRODUCTS COMPANY, INC.

Architects & Builders Building
Indianapolis, Indiana

NAVY'S LARGEST CARRIER

(*Continued from page* 165)

provide air conditioning and refrigeration for the vessel, one of the world's three largest fighting ships.

• **HEAT LOAD.**—U. S. Navy engineers point out that air conditioning is essential due to the tremendous heat generated by the machinery located throughout the ship and by her all-steel flight deck which absorbs the sun's heat. Experts have found that men get lethargic when sleeping and working in overheated areas and that air conditioning, good recreation, and comfortable quarters make for greater efficiency.

• **COMFORT.**—Never before has any ship offered the possibilities for maximum alertness which the U.S.S. Forrestal affords her 3,500-man crew. Sailors will descend broad stairways into air conditioned quarters, recreation and eating areas. An outlet placed over each pullman-type bunk will provide the occupant with conditioned air—cooled, dehumidified and filtered.

Many of the working spaces in the 1,036-foot steel hull will also be air conditioned such as the pilot's ready rooms, communications and combat information center, control compartments from which personnel operate the main propulsion plant, and other areas where personnel are enclosed for long periods.

• **SYSTEM.**—The seven Carrier refrigerating machines, through the action of finely balanced rotors 16 inches in diameter and spinning at 7,270 rpm, supply chilled water which is pumped to the central air conditioning equipment. Filtered air is passed over the cooling coils through which the chilled water is circulated. The machines use sea water for refrigerant condensing and were designed and built to meet all the requirements of combat vessels of the U. S. Navy.

Residential Air Conditioning

(*Continued from page* 114)

A. E. Diehl, chief engineer, Commercial Products, York Corp., spoke on the Air-conditioning and Refrigeration Institute Standard 6-10 for year 'round residential air conditioning. Prior to the drafting of this standard, existing methods for calculating air conditioning loads for residences gave results which varied as much as 2 to 1. Therefore, more than two years ago, a group representing manufacturers of air conditioning equipment were charged with the responsibility of preparing a standard which would result in more uniform results. The purpose of this standard is to specify minimum engineering standards for year 'round residential air conditioning.

This standard defines recommended practice and does not prevent the use of other standards where such use is justified by the economics of a case and where departures below good practice minimums are made clear.

The National Warm Air Manual 11 is a standard used by the National Warm Air Heating and Air Conditioning Association members for the application of air conditioning equipment to the average residence. It is a tentative manual that covers the design and installation of summer air conditioning systems in new houses as well as in existing houses. It outlines basic cooling estimate factors which are in close agreement with those outlined in ARI Standard 6-10 and differ only in the method of presentation. Both have been approved by the FHA and will be recognized in loan applications. Both methods are based on the fact that throughout the United States, there is a considerable range of temperature over a 24-hour period.

Canadian Degree-Days for November and December, 1954*

City	November		December	
	1954	Normal	1954	Normal
Calgary, Alta.	764	1122	1117	1426
Charlottetown, P. E. I.	822	858	1054	1246
Crescent Valley, B. C.	792	981	1128	1240
Edmonton, Alta.	946	1215	1274	1578
Fort William, Ont.	977	1143	1520	1596
Grande Prairie, Alta.	1014	1218	1494	1649
Halifax, N. S.	690	789	916	1138
London, Ont.	786	843	1228	1200
Medicine Hat, Alta.	699	1104	1104	1417
Moncton, N. B.	844	936	1152	1373
Montreal, P. Q.	834	948	1332	1407
North Bay, Ont.	984	1017	1550	1528
Ottawa, Ont.	878	984	1416	1494
Penticton, B. C.	624	813	986	1073
Porquis Junction, Ont.	1137	1266	1742	1786
Prince George, B. C.	798	1068	1274	1504
Quebec City, P. Q.	924	1050	1398	1534
Regina, Sask.	989	1355	1373	1779
St. John, N. B.	825	870	1121	1271
Saskatoon, Sask.	984	1305	1370	1767
Toronto, Ont.	705	817	1114	1155
Vancouver, B. C.	517	657	752	818
Victoria, B. C.	508	462	709	738
Windsor, Ont.	741	795	1104	1172
Winnipeg, Man.	1023	1302	1461	1829

*These data are supplied through the courtesy of the Meteorological Division Air Service Branch, Department of Transport, Canada.

COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available.

INDUSTRIAL VENTILATION CONFERENCE—The 14th Annual Conference for bringing together plant engineers, contractors and others interested in industrial ventilation, is co-sponsored by Michigan Department of Health, Division of Occupational Health, and Michigan State College, School of Engineering. Held at Kellogg Center, Michigan State College, East Lansing, Michigan. James C. Barrett, Ventilation Engineer, Division of Occupational Health, Michigan Department of Health, Lansing 4, Mich. . . . . **FEBRUARY 14-17, 1955.**

CORROSION ENGINEERS CONVENTION—Annual convention of the National Association of Corrosion Engineers, at the Palmer House, Chicago, Ill. A. B. Campbell, executive secretary of the Association, 1061 N&M Building, Houston 2, Tex. . . . . **MARCH 7-11, 1955.**

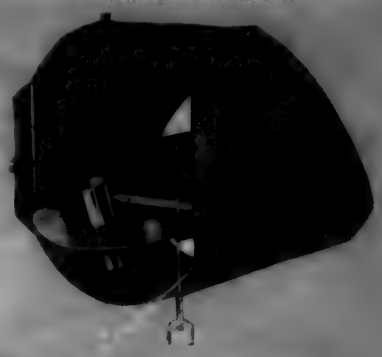
LUBRICATION ENGINEERS MEETING—Annual meeting and exhibit of the American Society of Lubrication Engineers, at the Hotel Sherman, Chicago, Ill. Wm. P. Youngclaus, Jr., secretary of the Society, 84 E. Randolph St., Chicago 1, Ill . . . . . **APRIL 13-15, 1955.**

OIL HEAT CONVENTION—33rd annual convention of the Oil-Heat Institute of America, tentatively set for the Conrad Hilton Hotel, Chicago, Ill. R. H. L. Becker, secretary of the Institute, 500 Fifth Ave., New York 36, N. Y. . . . . **APRIL 19-21, 1955.**

(*Concluded on page* 172)

For commercial & industrial heating with

GAS



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Now you can eliminate heavy fuel wastes with complete safety. With four years of perfect performance behind it the Field "MG" now carries the recommendation of leading gas companies across the country—fully safe, absolutely dependable, highly efficient. But be sure the control you install is a Field. In a gas installation only a perfect control is a good control.

Write for technical information and performance data on the Field "MG" Draft Control.

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Blend It... Hide It... Combine It...

Installed as a continuous strip in window head or sill (as above), AGITAIR STRIPLINE is the only practical means for air curtaining plate glass windows or wall areas to counteract summer heat or winter chill.

AGITAIR STRIPLINE DIFFUSERS

BLEND IT . . . specify AGITAIR STRIPLINE as a continuous decorative unit, or in sections to meet any requirements of interior treatment.

HIDE IT . . . in shallow lighting coves for perfect concealment.

COMBINE IT . . . with unit or continuous lighting fixtures.

AND REMEMBER . . . no matter how you use it — AGITAIR STRIPLINE diffusing vanes create maximum mixing and aspiration . . . quick temperature equalization . . . and correct air distribution over any desired length.

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(*Concluded from page* 170)

AIR POLLUTION MEETING—48th annual meeting of the Air Pollution Control Association, in Detroit, Mich. Harry C. Ballman, executive secretary of the Association, 4400 Fifth Ave., Pittsburgh 13, Pa. . . . . **MAY 22-26, 1955.**

GAS APPLIANCE MEETING—Annual meeting of the Gas Appliance Manufacturers Association, at the Ambassador Hotel, Los Angeles, Calif. H. Leigh Whitelaw, managing director of the Association, 60 E. 42nd St., New York, N. Y. . . . . **MAY 23-25, 1955.**

NDHA MEETING— 46th annual meeting of the National District Heating Association, at the Edgewater Beach Hotel, Chicago, Ill. John F. Collins, Jr., secretary of the Association, 827 N. Euclid Ave., Pittsburgh 6, Pa. . . . . **MAY 23-25, 1955.**

ASRE SPRING MEETING—Spring meeting of the American Society of Refrigerating Engineers, at the Hotel Schroeder, Milwaukee, Wis. R. C. Cross, secretary of the Society, 234 Fifth Ave., New York 1, N. Y. . . . . **JUNE 12-15, 1955.**

TESTING MATERIALS MEETING—Annual meeting of the American Society for Testing Materials, at the Chalfonte-Haddon Hall, Atlantic City, N. J. Secretary of the Society, 1916 Race St., Philadelphia, Pa. . . . . **JUNE 26-JULY 1, 1955.**

ASHAE MEETING—The semi-annual meeting of the American Society of Heating and Air-Conditioning Engineers in San Francisco, Calif. A. V. Hutchinson, executive secretary of the Society, 62 Worth St., New York 13, N. Y. . . . . **JUNE 27-29, 1955.**

INTERNATIONAL CONGRESS OF REFRIGERATION—Ninth International Congress of Refrigeration, sponsored by the International Institute of Refrigeration, to be held in the conference rooms of the Sorbonne in Paris, France. General Secretariat of the Congress, International Institute of Refrigeration, 177, Boulevard Malesherbes, Paris, France . . . . . **AUGUST 31-SEPTEMBER 15, 1955.**

INSTRUMENT SOCIETY CONFERENCE—Tenth Annual Conference and Exhibit of the Instrument Society of America, to be held at Shrine Exposition Hall and Shrine Auditorium, Los Angeles, Calif. John McCaffery, assistant executive secretary of the Society, 1319 Allegheny Ave., Pittsburgh 33, Pa. . . . . **SEPTEMBER 12-16, 1955.**

ASRE WINTER MEETING—Winter meeting of the American Society of Refrigerating Engineers, at the Hotel Statler, New York, N. Y. R. C. Cross, secretary of the Society, 234 Fifth Ave., New York 1, N. Y. . . . . **NOVEMBER 27-30, 1955.**

REFRIGERATION EXPOSITION—9th Exposition of the Air-Conditioning and Refrigeration Industry, at Atlantic City, N. J., sponsored by the Air-Conditioning and Refrigeration Institute. The name of this trade show, formerly known as the All-Industry Refrigeration and Air Conditioning Exposition, has been officially changed. George Jones, executive secretary of the Institute, 1346 Connecticut Ave., N. W., Washington, D. C. . . . . **NOVEMBER 28—DECEMBER 1, 1955.**

NUCLEAR CONGRESS—Nuclear Congress and Atomic Exposition, sponsored by the Engineers Joint Council, to be held in Cleveland, Ohio. Stewart E. Reimel, secretary of the Council, 29 W. 39th St., New York 18, N. Y. **DECEMBER 12-17, 1955.**

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ALPHABETICAL INDEX OF ADVERTISERS

A

Air Devices, Inc. 168
Air Filter Corp. 149
Airtemp Div. of Chrysler Corp. 78
Allen-Bradley Co. 56
Allen Cooler & Ventilator, Inc. 145
Allen, W. D., Manufacturing Co. 139
Allin Manufacturing Co. 149
Allis-Chalmers Manufacturing Co. 36-37-58
American Air Filter Co., Inc. 16–17
American Blower Corp. 24–45
American Brass Co. 77
American District Steam Co., Inc. 79
American Machine & Metals, Inc. 1
American Radiator & Standard Sanitary Corp. 44
Anemostat Corp. of America 27
Armstrong Machine Works ..... Inside Front Cover

B

Babcock & Wilcox Co., Boiler Div. 45
Barber-Colman Co. 54
Barry Blower Co. 147
Bell & Gossett Co. 42
Bishop & Babcock Manufacturing Co., Massachusetts Blower Division 39
Boiler Engineering & Supply Co., Inc., Continental Boiler Div. 12
Buffalo Forge Co. 51
Bush Manufacturing Co. 75

C

Carrier Corp. 165
Chase Brass & Copper Co. 38
Clarage Fan Co. ..... Inside Back Cover
Classified Advertisements 169
Cleaver-Brooks Co., Boiler Div. 49
Cook, Loren, Co. 76
Copeland Refrigeration Corp. 69
Crane Co. 50

D

Davis Engineering Co. 147
Dehothezat Fans Div., American Machine & Metals, Inc. 1
Delta Heating Corp. 168
Domestic Pump & Manufacturing Co. 60
Duriron Co., Inc. 65
Dwyer, F. W., Mfg. Co. 157

E

Elgen Manufacturing Corp. 68

F

Farr Co. 57
Field Control Div., H. D. Conkey & Co. 167
Frick Company 80

G

General Blower Co. 160
General Electric Co. 28
Goodyear Tire & Rubber Co., Inc. 11
Gustin-Bacon Manufacturing Co. 15

H

Halstead & Mitchell 137
Hoffman Specialty Mfg. Co. 67

I

Illinois Engineering Co. 74
Illinois Testing Laboratories, Inc. 155
Industrial Press 52–53–66
Infra Insulation, Inc. 5
Ingersoll-Rand Co. 139
Interstate Heater Manufacturing Co. 162

J

Jenkins Bros. 31
Jenn-Air Products Co., Inc. 166
Johnson Service Co. ..... Back Cover
Joy Manufacturing Co. 72

K

Kramer Trenton Co. 14

M

Maid-O'-Mist, Inc. 147
Marlo Coil Co. 70
Marsh Heating Equipment Co. 62
McDonnell & Miller, Inc. 41
Minneapolis-Honeywell Regulator Co. 20–21
Modine Manufacturing Co. 59–145
Myers, E. F. & Bro., Co. 23

N

Nash Engineering Co. 82
National Tube Div., United States Steel Corp. 40
Nesbitt, John J., Inc. 9
Niagara Blower Co. 157
Novelty Steam Boiler Works, Inc. 157

O

Owens-Corning Fiberglas Corp. 61

P

Patterson-Kelley Co., Inc. 143
Peerless of America, Inc. 134
Petro 64
Powers Regulator Co. 13–164
Pyle-National Co. 46

R

Ramset Fasteners, Inc. 161
Reading Tube Corp. 81
Redmond Co., Inc. 155
Revere Copper & Brass, Inc. 133
Reznor Manufacturing Co. 26
Ric-wil, Inc. 22

S

SelecTemp Div., Iron Fireman Manufacturing Co. 43
Skidmore Corporation 73
Standard Stamping & Perforating Co. 140
Sturtevant Div., Westinghouse Electric Corp. 7
Superior Combustion Industries, Inc. 47

T

Titusville Iron Works Co. 73
Trane Co. 18–19
Tube-Turns ..... Insert 33–34

U

Union Asbestos & Rubber Co. 35
United States Steel Corp. 40

W

Want Advertisements 169
Watts Regulator Co. 170
Webster, Warren & Co. 2
Weil Pump Co. 145
Weinman Pump Mfg. Co. 163
Weirton Steel Co., National Steel Corp. 29
Westinghouse Electric Corp., Sturtevant Div. 7
Wing, L. J., Mfg. Co. 48
Worthington Corp. 30

Y

York Corp. 32
Youngstown Sheet & Tube Co. 63

Z

Zonolite Co., Z-Crete Div. 55

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Dry Bulb Temp., °F.	Relative Humidity, Per-Cent									
	42	44	46	48	50	52	54	56	58	60
	Absolute Humidity, Grains per Cubic Foot									
30	.82	.85	.89	.93	.97	1.01	1.05	1.09	1.13	1.17
35	1.00	1.05	1.09	1.14	1.18	1.23	1.28	1.33	1.38	1.42
40	1.20	1.26	1.32	1.37	1.43	1.49	1.55	1.60	1.66	1.72
45	1.44	1.51	1.58	1.65	1.72	1.78	1.85	1.93	1.99	2.06
50	1.73	1.81	1.89	1.97	2.05	2.14	2.22	2.30	2.38	2.46
55	2.05	2.15	2.25	2.35	2.44	2.54	2.64	2.74	2.84	2.93
60	2.44	2.55	2.67	2.78	2.90	3.02	3.13	3.25	3.36	3.48
61	2.52	2.64	2.76	2.88	3.00	3.12	3.24	3.36	3.48	3.60
62	2.61	2.73	2.85	2.98	3.10	3.23	3.35	3.47	3.60	3.72
63	2.69	2.82	2.95	3.08	3.21	3.33	3.46	3.59	3.72	3.85
64	2.78	2.92	3.05	3.18	3.32	3.45	3.58	3.71	3.85	3.98
65	2.88	3.01	3.15	3.29	3.43	3.56	3.70	3.84	3.97	4.11
66	2.97	3.12	3.26	3.40	3.54	3.68	3.82	3.97	4.11	4.25
67	3.07	3.22	3.37	3.51	3.66	3.80	3.95	4.10	4.24	4.39
68	3.18	3.33	3.48	3.63	3.78	3.93	4.08	4.23	4.38	4.54
69	3.28	3.44	3.59	3.75	3.90	4.06	4.22	4.37	4.53	4.69
70	3.39	3.55	3.71	3.87	4.03	4.19	4.36	4.52	4.68	4.84
71	3.50	3.66	3.83	4.00	4.16	4.33	4.50	4.66	4.83	5.00
72	3.61	3.78	3.96	4.13	4.30	4.47	4.64	4.82	4.99	5.16
73	3.73	3.91	4.08	4.26	4.44	4.62	4.79	4.97	5.15	5.33
74	3.85	4.03	4.22	4.40	4.58	4.77	4.95	5.13	5.32	5.50
75	3.97	4.16	4.35	4.54	4.73	4.92	5.11	5.30	5.49	5.68
76	4.10	4.29	4.49	4.69	4.88	5.08	5.27	5.47	5.66	5.86
77	4.23	4.43	4.63	4.83	5.04	5.24	5.44	5.64	5.84	6.04
78	4.36	4.57	4.78	4.99	5.20	5.40	5.61	5.82	6.03	6.24
79	4.50	4.72	4.93	5.15	5.36	5.57	5.79	6.00	6.22	6.43
80	4.64	4.86	5.09	5.31	5.53	5.75	5.97	6.19	6.41	6.63
81	4.79	5.02	5.24	5.47	5.70	5.93	6.16	6.38	6.61	6.84
82	4.94	5.17	5.41	5.64	5.88	6.11	6.35	6.58	6.82	7.05
83	5.09	5.33	5.58	5.82	6.06	6.30	6.55	6.79	7.03	7.27
84	5.25	5.50	5.75	6.00	6.25	6.50	6.75	7.00	7.25	7.50
85	5.41	5.67	5.92	6.18	6.44	6.70	6.95	7.21	7.47	7.73
86	5.57	5.84	6.11	6.37	6.64	6.90	7.17	7.43	7.70	7.96
87	5.74	6.02	6.29	6.56	6.84	7.11	7.39	7.66	7.93	8.21
88	5.92	6.20	6.48	6.76	7.05	7.33	7.61	7.89	8.17	8.45
89	6.10	6.39	6.68	6.97	7.26	7.55	7.84	8.13	8.42	8.71
90	6.28	6.58	6.88	7.18	7.48	7.77	8.07	8.37	8.67	8.97
92	6.66	6.98	7.29	7.61	7.93	8.25	8.56	8.88	9.20	9.51
94	7.06	7.40	7.73	8.07	8.41	8.74	9.08	9.41	9.75	10.09
96	7.48	7.84	8.19	8.55	8.91	9.26	9.62	9.97	10.33	10.69
98	7.92	8.30	8.68	9.05	9.43	9.81	10.19	10.56	10.94	11.32
100	8.39	8.79	9.18	9.58	9.98	10.38	10.78	11.18	11.58	11.98
102	8.87	9.29	9.72	10.14	10.56	10.98	11.41	11.83	12.25	12.67
104	9.38	9.83	10.28	10.72	11.17	11.62	12.06	12.51	12.96	13.40
106	9.92	10.39	10.86	11.33	11.81	12.28	12.75	13.22	13.69	14.17
108	10.48	10.98	11.48	11.97	12.47	12.97	13.47	13.97	14.47	14.97
110	11.06	11.59	12.12	12.64	13.17	13.70	14.23	14.75	15.28	15.81

Dry Bulb Temp., °F	Relative Humidity, Per-Cent									
	61	62	63	64	65	66	67	68	69	70
	Absolute Humidity, Grains per Cubic Foot									
30	1.28	1.30	1.32	1.34	1.36	1.38	1.40	1.42	1.44	1.46
35	1.44	1.47	1.49	1.52	1.54	1.57	1.59	1.61	1.64	1.66
40	1.75	1.78	1.80	1.83	1.86	1.89	1.92	1.95	1.98	2.00
45	2.09	2.13	2.16	2.20	2.23	2.27	2.30	2.33	2.37	2.40
50	2.51	2.55	2.59	2.63	2.67	2.71	2.75	2.79	2.83	2.88
55	2.98	3.03	3.08	3.13	3.18	3.23	3.28	3.32	3.37	3.42
60	3.54	3.60	3.65	3.71	3.77	3.83	3.89	3.94	4.00	4.06
61	3.66	3.72	3.78	3.84	3.90	3.96	4.02	4.08	4.14	4.20
62	3.78	3.85	3.91	3.97	4.03	4.09	4.16	4.22	4.28	4.34
63	3.91	3.98	4.04	4.10	4.17	4.23	4.30	4.36	4.42	4.49
64	4.04	4.11	4.18	4.24	4.31	4.38	4.44	4.51	4.57	4.64
65	4.18	4.25	4.32	4.39	4.45	4.52	4.59	4.66	4.73	4.80
66	4.32	4.39	4.46	4.53	4.60	4.67	4.74	4.82	4.89	4.96
67	4.46	4.54	4.61	4.68	4.76	4.83	4.90	4.98	5.05	5.12
68	4.61	4.69	4.76	4.84	4.91	4.99	5.07	5.14	5.22	5.29
69	4.76	4.84	4.92	5.00	5.08	5.15	5.23	5.31	5.39	5.47
70	4.92	5.00	5.08	5.16	5.24	5.32	5.40	5.48	5.57	5.65
71	5.08	5.16	5.25	5.33	5.41	5.50	5.58	5.66	5.75	5.83
72	5.25	5.33	5.42	5.50	5.59	5.68	5.76	5.85	5.93	6.02
73	5.42	5.50	5.59	5.68	5.77	5.86	5.95	6.04	6.13	6.22
74	5.59	5.68	5.77	5.87	5.96	6.05	6.14	6.23	6.32	6.42
75	5.77	5.87	5.96	6.05	6.15	6.24	6.34	6.43	6.53	6.62
76	5.95	6.05	6.15	6.25	6.34	6.44	6.54	6.64	6.74	6.83
77	6.14	6.24	6.35	6.45	6.55	6.65	6.75	6.85	6.95	7.05
78	6.34	6.44	6.55	6.65	6.75	6.86	6.96	7.07	7.17	7.27
79	6.54	6.65	6.75	6.86	6.97	7.08	7.18	7.29	7.40	7.50
80	6.74	6.85	6.97	7.08	7.19	7.30	7.41	7.52	7.63	7.74
81	6.95	7.07	7.18	7.30	7.41	7.52	7.64	7.75	7.87	7.98
82	7.17	7.29	7.41	7.52	7.64	7.76	7.88	7.99	8.11	8.23
83	7.39	7.52	7.64	7.76	7.88	8.00	8.12	8.24	8.36	8.48
84	7.62	7.75	7.87	8.00	8.12	8.25	8.37	8.50	8.62	8.75
85	7.86	7.98	8.11	8.24	8.37	8.50	8.63	8.76	8.89	9.01
86	8.10	8.23	8.36	8.49	8.63	8.76	8.89	9.02	9.16	9.29
87	8.34	8.48	8.62	8.75	8.89	9.03	9.16	9.30	9.44	9.57
88	8.59	8.74	8.88	9.02	9.16	9.30	9.44	9.58	9.72	9.86
89	8.85	9.00	9.14	9.29	9.43	9.58	9.73	9.87	10.02	10.16
90	9.12	9.27	9.42	9.57	9.72	9.87	10.02	10.17	10.32	10.47
92	9.67	9.83	9.99	10.15	10.31	10.47	10.62	10.78	10.94	11.10
94	10.25	10.42	10.59	10.76	10.93	11.09	11.26	11.43	11.60	11.77
96	10.87	11.04	11.22	11.40	11.58	11.76	11.93	12.11	12.29	12.47
98	11.52	11.70	11.88	12.07	12.26	12.45	12.64	12.83	13.02	13.20
100	12.18	12.38	12.58	12.78	12.98	13.18	13.38	13.58	13.78	13.98
102	12.89	13.10	13.31	13.52	13.73	13.94	14.15	14.36	14.57	14.79
104	13.63	13.85	14.07	14.30	14.52	14.74	14.97	15.19	15.41	15.64
106	14.40	14.64	14.87	15.11	15.35	15.58	15.82	16.06	16.29	16.53
108	15.22	15.47	15.72	15.97	16.21	16.46	16.71	16.96	17.21	17.46
110	16.07	16.33	16.60	16.86	17.12	17.39	17.65	17.91	18.18	18.44

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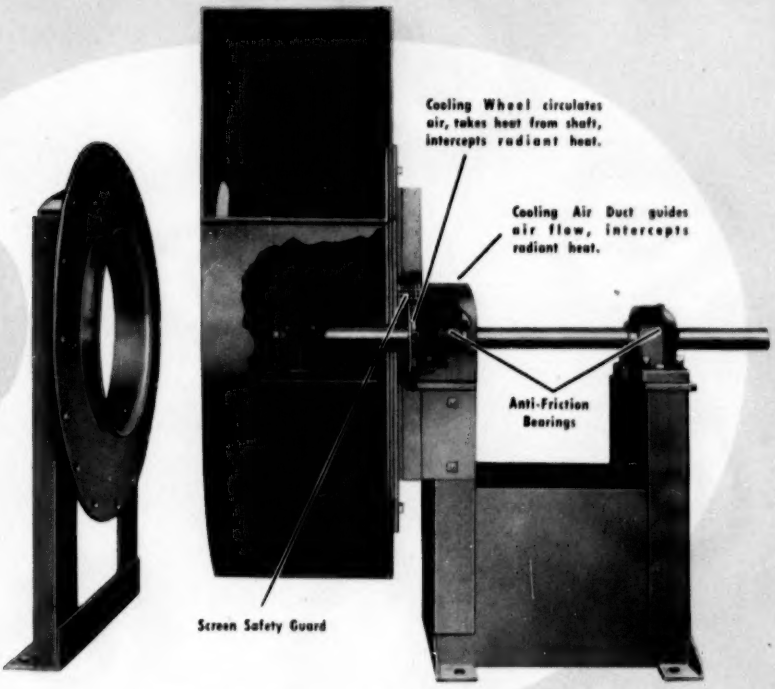
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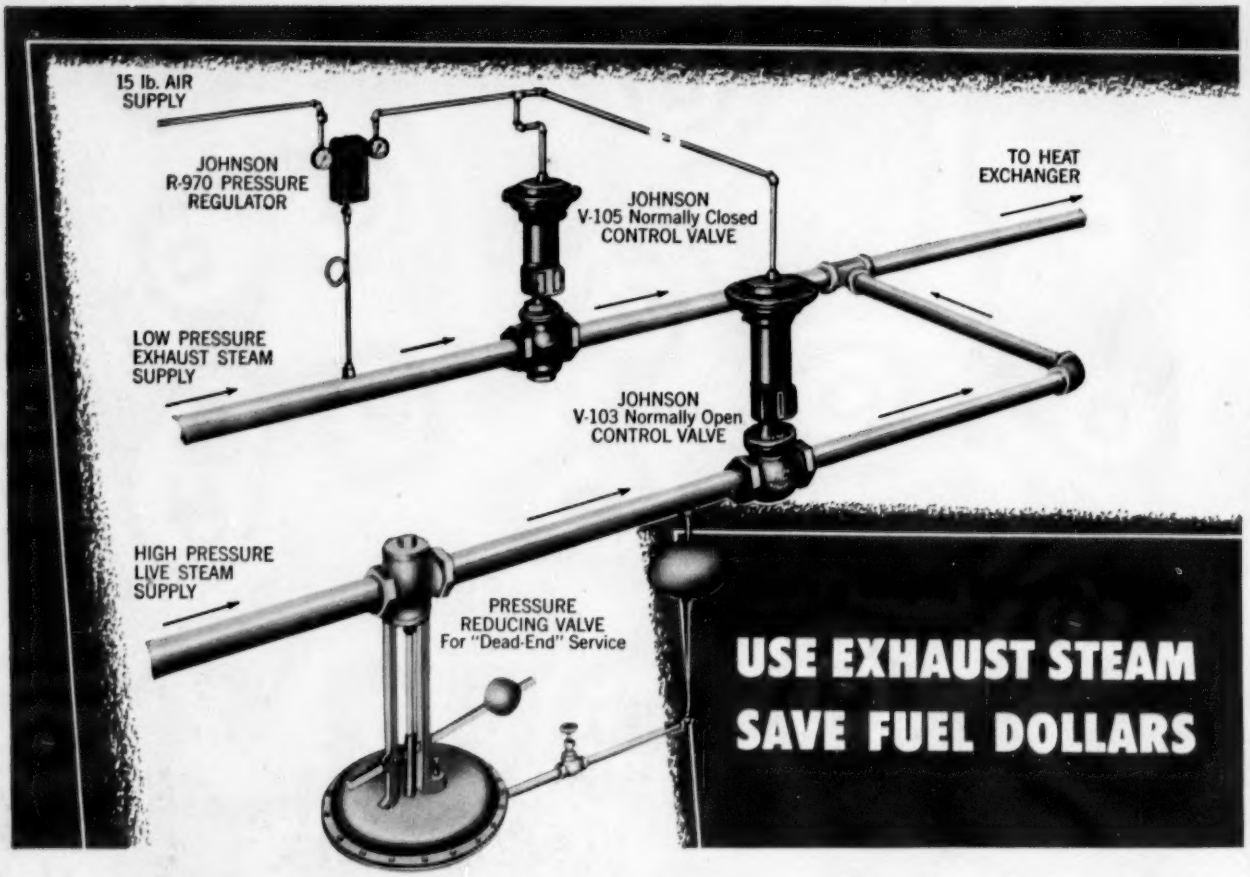
15 lb. AIR SUPPLY
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